LIBERAL ACADEMIC CONSERVATISM, CONSERVATIVE ACADEMIC LIBERALISM, AND BIOCHEMISTRY

A History of the Academic Faculty of Biochemistry and Molecular Biology, College of Biological Sciences, The Ohio State University

F. E. DEATHERAGE
Professor of Biochemistry and Molecular Biology

The Department of Agricultural Chemistry, 1882-1896

The Department of Agricultural Chemistry
College of Agriculture, 1896-1916

The Department of Agricultural Chemistry Soils
College of Agriculture, 1916-1922

The Department of Agricultural Chemistry
College of Agriculture, 1922-1948

The Department of Agricultural Biochemistry
College of Agriculture, 1948-1966

The Department of Biochemistry
College of Biological Sciences, 1966-1967

Academic Faculty of Biochemistry and Molecular Biology
College of Biological Sciences, 1967 –

The Ohio State University
1969

CONTENTS

I. PREFACE AND PERSONAL NOTE

As the Ohio State University celebrates its centennial the Board of Trustees through its Secretary, John T. Mount, has asked each unit to prepare a history of its work. The initial sentence of this charge states "one of the major purposes of the Centennial observance is to assess our first 100 years and to utilize this heritage as a foundation for building an even greater institution". This request carries a deep responsibility because what is now the Faculty of Biochemistry and Molecular Biology in the College of Biological Sciences was initially organized by action of the Board of Trustees in 1882 as a Professorship of Agricultural Chemistry. Then too, all through the years the department, beginning with its first Professor, Henry Adam Weber, has functioned at the interface of classical colleges and disciplines and therefore has been affected, profoundly at times, by divergencies of educational philosophies, by rigid academic conservatism and by rivalries among various units within the university. Yet because of its unique position in University affairs, the department's influence has been felt in a very constructive way over the years in the development of the University. But we would be deluding ourselves to say that, as a group, we of this Faculty of Biochemistry and Molecular Biology have reached the maturity and stature that is desirable and proper in this centennial year. Consequently, in telling our history in a manner to fulfill the Trustees' charge, I must examine our heritage in a searching manner for some answers as to why we have not as yet achieved some of our goals.

In carrying out this responsibility, I may view events in the history of the university differently than others, since I have been so closely involved in the department's growth for over 30 years. But this is no cause for apology because to make this history useful, it is necessary not only to relate events but to try to understand their significance for their time and for their effects on the future of the university and its students.

I shall not give detailed references throughout. University bulletins, catalogs, reports and archives yield much useful information. Mr. Alexis Cope, an early Secretary of the Board of Trustees, preserved many significant details in his early history of the University as have other University historians, notably Professor James Pollard. At times my interpretation of the significance of certain events may differ from these scholars. My perspective certainly is different and I have the advantage of observing over a longer period of time how certain events shaped our own development.

As I studied the history of the University, it is easy to detect

the long range effect on the University of certain early attitudes of individuals and groups of individuals - students, faculty, trustees and citizens representing rural and urban interests, church interests, and private and public school interests.

When I first arrived at the Ohio State University I was surprised in the manner many Ohioans viewed their Land Grant University, at the low level of financial support the University was receiving, at the great disparity of support within the various university units, and at the rigid college barriers hampering the development of some educational programs long taken for granted in other universities. At the time I found these situations difficult to understand from my own background and educational experience -- a graduate of a church related liberal arts college uniquely associated with the promotion of the Land Grant university system, a graduate student of my own state university which generally was held in a position of admiration by people of the state, and then a graduate student and instructor in the non-land grant university of a neighboring state relatively free of some of the attitudes prevalent at the Ohio State University of 1940. Little did I realize then that most of my professional life would be concerned with trying to understand these problems and to affect their solutions.

II. PROLOGUE

As families moved west to seek their fortune in building the United States they not only brought their religion but also a concern for education so that they and their children could develop the new country. These early settlers were aware that schools, as well as churches, were important focal points for community development. They were generally convinced of the value of education for themselves and their descendents as they exercised their rights of life, liberty and pursuit of happiness.

Local schools were established as resources would permit. Soon there followed church colleges with their preparatory departments or academies which served to bridge the secondary school gap between elementary school and college because only the larger population centers had high schools. These colleges, while getting financial support from the richer eastern churches, were on occasion "missionary" colleges nutured by the established eastern colleges and universities. These classically oriented liberal arts colleges were steeped in their own religious traditions. There were many of these colleges established in Ohio, Indiana, Michigan, Illinois and in other new states of the developing nation. These colleges served their states and churches well while at the same time developing a parochial conservatism which often led to intense opposition, particularly in Ohio, to the establishment of the Land Grant universities which ultimately set the pattern for publicly supported higher education. Now in the United States 40% of the college age population beyond 18 years old attend college whereas of the same age group 15% in France, 10% in the United Kingdom, 7% in Italy and Germany and 1% or less in developing and underdeveloped countries are in universities. Such is the result the traditional American attitude on the value of education.

The visions of a number of early educators set the patterns for our uniquely American system of higher education. Some of these visionaries (or radicals as they sometimes were called in their day) contributed their labors to the public primary and secondary schools, while others devoted themselves to a new concept of higher education which indeed had profound influence on every facet of the character of the United States and its people.

Now in the late 1960's, American universities are experiencing student unrest, a situation common in many other countries for years but a new phenomenon here. It is difficult for many to comprehend in

view of our traditions. But in this present era of unrest in American universities not a few observers feel that perhaps we have lost sight of the meaning and purpose of the university. Perhaps then as a prelude to this brief history it might be in order to reexamine some of the thinking of one of those radicals who had a significant part in the establishment of the Land Grant College movement. So great was this man's role that President Edmund Janes James of the University of Illinois said in 1911 that "the real credit for originating the plan incorporated in the Land Grant Act belongs to an Illinois farmer and professor, Jonathan B. Turner."

When several Yale graduates ventured to the prairies to organize Illinois College as a Presbyterian college in Jacksonville they felt the need for a professor of Greek and Latin for this first institution of higher learning in that state. So its president, Edward Beecher of the new faculty of four, naturally turned to President Jeremiah Day of Yale for suggestions. So impressed was he with a certain young man that President Day excused him from the remainder of his last year's work at Yale, gave him his diploma and sent Jonathan Baldwin Turner to take the vacant post in 1833.

Turner was an articulate and imaginative fellow who knew how to express himself well in speech and in writing. As many young professors of his and modern days, he dared to explore new ideas. Although he was a professor of classics and later of rhetoric and English literature, he was soon convinced that perhaps the educational system of that day was not serving the needs of the people who were trying to build a new nation from raw prairie. He became a champion of educational reform first at the school level and later at the college level and was convinced that the classical liberal arts education was serving only a limited few -- preachers, teachers, lawyers, and physicians generally. He also became an outspoken abolitionist in a young college having a number of southern students and receiving money from some southern churchmen. A third cause which occupied his time was trying to overcome church conservatism and orthodoxy. So this "born radical", understandably, became the center of controversy inside and outside Illinois College. His reputation and writings, of course, attracted attention of the churchmen in the east and money to run Illinois College noticeably decreased from church sources. After 16 years as a professor of the "humane" subjects he was eased out by a friendly resignation.

Of course Professor Turner was very popular with a great majority of students at Illinois College who like all college students were prone to demonstrate. But Professor Turner, keenly aware of his goals and his responsibilities, kept his cool which projected to his

student sympathizers. The net result of the turmoil was, of course, a petition -- Would Professor Turner teach a Sunday School class at the Congregational Church? All signers agreed to attend and did. The class became a local institution far more influential than an ordinary Bible class because Professor Turner did not leave Jacksonville and maintained good informal relations with the faculty and students of the college. But how to survive with a young family and no income! He turned his avocation - horticulture - into a vocation, and started a nursery. He introduced the osage orange to provide fences to enclose farms on the prairie with few native trees to give suitable wood for rail fences. He contributed a new raspberry bearing his name and invented a few minor agricultural implements. These pursuits, which provided his livelihood and much of his expenses for continuing his work for a better educational system, served to sharpen his awareness of the deficiencies of the traditional education of the liberal arts church college in fulfilling the needs for what he called the "industrial classes", the great bulk of the population.

Because of his abilities as a speaker and preacher Professor Turner became an ardent champion of education for all. Although he contributed significantly to the organization of the public school system in his state, his efforts were largely directed to developing his ideas for the "industrial university". His many speaking engagements offered him a platform to test his ideas. He, of course, made enemies as well as friends. So intense were some of the animosities generated by his stand on slavery that he was threatened by kidnappers. He had many additional problems. For example, he had to develop a smuggling system to bring osage orange seeds from the south to maintain his nursery business. His most severe loss came by arsonists who burned his nursery in the wee hours of the morning he was to be a featured speaker at the Illinois State Fair. Such was his character that he went on with his speech without allowing any reference by himself or his official hosts to the loss that threatened his family and his livelihood. But by midmorning the news got to the fairgoers who, by the time his speech was over, had passed the hat and collected sufficient money to assure at least that Professor Turner's nursery could be reestablished.

Professor Turner used every opportunity to sell his ideas of what he called the "industrial university". He was well known and respected by political and educational leaders even though some did not agree with his radical views of what a university should be. He actively promoted the "industrial university" and it appeared that national acceptance of some of his ideas was near when Congress passed a version of the Land Grant Act in the administration of President James Buchanan. But, also, his hopes received a stunning blow when President Buchanan vetoed the bill. Yet this did not stop

Turner. Although direct evidence is scanty, legend has it that in 1860 Turner got a promise from Stephen A. Douglas and Abraham Lincoln that whoever won the Presidency would approve the act if Congress again would favorably consider the plan for state universities supported by federal land grants. The story does indeed seem reasonable because Turner knew both Lincoln and Douglas well since the political careers of the two candidates centered in adjoining counties with Illinois College as its educational focal point.

So the Morrill Act became the law of the land in 1862. Immediately Professor Turner worked diligently for Illinois to establish its university. But his faith in lower level politicians around the state legislature turned to disillusionment at the wheeling and dealing involved in locating the university. He was keenly disappointed and separated himself for a time from the movement and did not accept direct organizational responsibility for the establishment of the state university although requested to do so. But his cause had reached fruition even though he incurred the wrath of many classical scholars and church college colleagues throughout the state and nation. His missionary zeal of carrying the issue directly to the people had triumphed and he attended the cornerstone laying of the Illinois Industrial University in Champaign County. His concepts and ideas were the guidelines for its organization and early educational program and his daughter later became a trustees. His mark was placed on the University which, even at the time of his death in 1892, was being cited by many as a model state university. Indeed because of many troubles Ohio State University was experiencing, a mission of state legislators and university officials was sent in 1879 to study the University of Illinois.

What were these radical ideas of the erstwhile professor of Greek and Latin turned educational maverick? The profoundness of his thinking produced what, on the occasion of the Morrill Act Centennial, President David Henry of the University of Illinois has called the "blueprint"-"for public higher education in the United States." Professor Turner's educational philosophy might serve as prologue for understanding some aspects of the Ohio State University's early history. Unfortunately Ohio had no such articulate, effective, and fearless professor who came from their own college ranks to challenge the limited scope and educational mission of the church oriented liberal arts college and who could blunt the oftentimes violent opposition of these "liberal" educators to the revolutionary concept of higher education that we in the U.S.A. take for granted today. Let us see what Professor Turner stood for when he, as its President, addressed the Illinois Teachers Institute in 1850:

"Citizens of Griggsville: Some here will recollect that a few years ago I delivered an address to you in this place, the first that I

ever did deliver on industrial education. For several years the advocates of that scheme were branded in the public print with all sorts of opprobrious epithets by the long-eared guardians of our faith, our morals, and our civilization. We were denounced as ruthless and visionary agitators and outlaws. The bill for richly and appropriately endowing such institutions, involving the expenditure of millions of money, is now favorably and hopefully before Congress, and great sovereign States are disputing, through the press, about the honor of having originated the scheme. It is my own firm belief that you are the first people in the Union, and the first in the civilized world, that ever gave to that scheme a warm, earnest, and decided support. Certainly, the reception you gave it led me first to regard it as practically hopeful as well as truly needful.

All civilized society is, necessarily, divided into two distinct cooperative, not antagonistic, classes; a small class, whose proper business it is to teach the true principles of religion, law, medicine, science, art, and literature; and a much larger class, who are engaged in some form of labor in agriculture, commerce, and the arts. For the sake of convenience, we will designate the former the professional, and the latter the industrial class; not implying that each may not be equally industrious, the one in their intellectual, the other in their industrial pursuits. Probably in no case would society ever need more than five men out of one hundred in the professional class, leaving ninety-five in every hundred in the industrial; and, so long as so many of our ordinary teachers and public men are taken from the industrial class, as there are at present, and probably will be for generations to come, we do not really need over one professional man for every hundred, leaving ninety-nine in the industrial class.

The vast difference, in the practical means, of an appropriate liberal education, suited to their wants and their destiny, which these two classes enjoy, and ever have enjoyed the world over, must have arrested the attention of every thinking man. True, the same general abstract science exists in the world for both classes alike; but the means of bringing this abstract truth into effectual contact with the daily business and pursuits of the one class does exist, while in the other case it does not exist, and never can till it is new created.

The one class have schools, seminaries, colleges, universities, apparatus, professors, and multitudinous appliances for educating and training them, for months and years, for the peculiar profession which is to be the business of their life; and they have already created, each class for its own use, a vast and voluminous literature that would well-nigh sink a whole navy of ships.

But where are the universities, the apparatus, the professors, and the literature specifically adapted to any one of the industrial classes?

Echo answers, Where? In other words, society has become, long since, wise enough to know that its teachers need to be educated; but it has not yet become wise enough to know that its workers need education just as much. In these remarks I have not forgotten that our common schools are equally adapted and applied to all classes; but reading, writing, etc., are, properly, no more education than gathering seed is agriculture, or cutting ship-timber navigation. They are the mere rudiments, as they are called, or means - the mere instrument of an after education; and, if not so used, they are and can be of little more use to the possessor than an ax in the garret or a ship rotting upon the stocks.

Nor am I unmindful of the efforts of the monarchs and aristocrats of the Old World in founding schools for the "fifteenth cousins" of their order, in hopes of training them into a sort of genteel farmers, or rather overseers of farmers; nor yet of the several "back fires" (as the Prairie Farmer significantly designates them) set by some of our older professional institutions to keep the rising and blazing thought of the industrial masses from burning too furiously. They have hauled a canoe alongside of their huge professional steamships and invited all the farmers and mechanics of the State to jump on board and sail with them; but the difficulty is, they will not embark. We thank them for even this courtesy. It shows that their hearts are yearning toward us, notwithstanding the ludicrous awkwardness of their first endeavors to save us.

An answer to two simple questions will perhaps sufficiently indicate our ideas of the whole subject, though that answer on the present occasion must necessarily be confined to a bare outline. The first question, then, is this:

I. What do the industrial classes want?

The first question may be answered in few words. They want, and they ought to have, the same facilities for understanding the true philosophy, the science and the art of their several pursuits (their life business), and of efficiently applying existing knowledge thereto, and widening its domain, which the professional classes have long enjoyed in their pursuits. Their first labor is, therefore, to supply a vacuum from fountains already full, and bring the living waters of knowledge within their own reach. Their second is, to help fill the fountains with still greater supplies. They desire to depress no institution, no class whatever; they only wish to elevate themselves and their pursuits to a position in society to which all men acknowledge they are justly entitled, and to which they also desire to see them aspire.

The second question is:

II. How, then, can that want be supplied?

In answering this question, I shall endeavor to present, with all

possible frankness and clearness, the outline of impressions and convictions that have been gradually deepening in my own mind, for the past twenty years, and let them pass for whatever the true friends of the cause may think them worth.

And I answer, first, negatively, that this want cannot be supplied by any of the existing institutions for the professional classes, nor by any incidental appendage attached to them as a mere secondary department.

These institutions were designed and adapted to meet the wants of the professional classes, as such - especially the clerical order; and they are no more suited to the real wants of the industrial class than the institution we propose for them would be suited to the professional class.

Their whole spirit and aim is, or should be, literary and intellectual - not practical and industrial; to make men of books and ready speech - not men of work, and industrial, silent thought. But the very best classical scholars are often the very worst practical reasoners; and that they should be made workers is contrary to the nature of things, the fixed laws of God. The whole interest, business, and destiny for life of the two classes run in opposite lines; and that the same course of study should be equally well adapted to both is as utterly impossible as that the same pursuits and habits should equally concern and benefit both classes.

The industrial classes know and feel this, and therefore they do not, and will not, patronize these institutions, only so far forth as they desire to make professional men for public use. As a general fact, their own multitudes do, and will forever, stand aloof from them; and, while they desire to foster and cherish them for their own appropriate uses, they know that they do not, and can not, fill the sphere of their own urgent industrial wants. They need a similar system of liberal education for their own class, and adapted to their own pursuits; to create for them an industrial literature, adapted to their professional wants; to raise up for them teachers and lecturers for subordinate institutes; and to elevate them, their pursuits, and their posterity to that relative position in human society for which God designed them.

The whole history of education, both in Protestant and Catholic countries, shows that we must begin with the higher institutions, or we can never succeed with the lower; for the plain reason that neither knowledge nor water will run uphill. No people ever had, or ever can have, any system of common schools and lower seminaries worth anything until they have first founded their higher institutions and fountains of knowledge from which they could draw supplies of teachers, etc., for

the lower. We would begin, therefore, where all experience and common sense show that we must begin, if we would effect anything worthy of an effort.

In this view of the case, the first thing wanted in this process is a National Institute of Science, to operate as the great central luminary of the national mind, from which all minor institutions should derive light and heat, and toward which they should also reflect back their own. This primary want is already, I trust, supplied by the Smithsonian Institute, endowed by James Smithson, and incorporated by the United States Congress at Washington, D.C.

To cooperate with this noble institute, and enable the industrial classes to realize its benefits in practical life, we need a University for the Industrial Classes in each of the States, with their consequent subordinate institutes, lyceums, and high schools in each of the counties and towns.

The objects of these institutes should be to apply existing knowledge directly and efficiently to all practical pursuits and professions in life, and to extend the boundaries of our present knowledge in all possible practical directions.

Plan for the State University. - There should be connected with such an institution, in this State, a sufficient quantity of land, of variable soil and aspect, for all its needful annual experiments and processes in the great interests of agriculture and horticulture.

Buildings of appropriate size and construction for all its ordinary and special uses; a complete philosophical, chemical, anatomical, and industrial apparatus; a general cabinet, embracing everything that relates to, illustrates, or facilitates any one of the industrial arts, especially all sorts of animals, birds, reptiles, insects, trees, shrubs, and plants found in this State and adjacent States.

Instruction should be constantly given in the anatomy and physiology, the nature, instincts, and habits of all animals, insects, trees, and plants; their laws of propagation, primogeniture, growth, and decay, disease and health, life and death; on the nature, composition, adaptation, and regeneration of soils; on the nature, strength, durability, preservation, perfection, composition, cost, use, and manufacture of all materials of art and trade; on political, financial, domestic, and manual economy (or the saving of labor of the hand) to all industrial processes; on the true principles of national, constitutional, and civil law, and the true theory and art of governing and controlling or directing the labor of men in the State, the family, shop, and farm; on the laws of vicinage, or the laws of courtesy and comity between neighbors,

as such, and on the principles of health and disease in the human subject, so far at least as is needful for household safety; on the laws of trade and commerce, ethical, conventional, and practical; on book-keeping and accounts; and, in short, in all those studies and sciences, of whatever sort, which tend to throw light upon any art or employment which any student may desire to master, or upon any duty he may be called to perform, or which may tend to secure his moral, civil, social, and industrial perfection as a man.

No species of knowledge should be excluded, practical or theoretical; unless, indeed, those specimens of "organized ignorance" found in the creeds of party politicians and sectarian ecclesiastics should be mistaken by some for a species of knowledge.

Whether a distinct classical department should be added, or not, would depend on expediency. It might be deemed best to leave that department to existing colleges as their more appropriate work, and to form some practical and economical connection with them for that purpose; or it might be best to attach a classical department in due time to the institution itself.

To facilitate the increase and practical application and diffusion of knowledge, the professors should conduct, each in his own department, a continued series of annual experiments.

For example, let twenty or more acres of each variety of grain (each acre accurately measured) be annually sown, with some practical variation on each acre, as regards the quality and preparation of the soil, the kind and quantity of seed, the time and mode of sowing or planting, the time and modes and processes of cultivation and harvesting, and an accurate account kept of all costs, labor, etc., and of the final results. Let analogous experiments be tried on all the varied products of the farm, the fruit-yard, the nursery, and the garden; on all modes of crossing, rearing, and fattening domestic animals, under various degrees of warmth and light, with and without shelter; on green, dry, raw, ground, and cooked food, cold and warm; on the nature, causes, and cure of their various diseases, both of those on the premises and of those brought in from abroad; and advice given, and annual reports made on those and all similar topics. Let the professors of physiology and entomology be ever abroad at the proper seasons, with the needful apparatus for seeing all things visible and invisible, and scrutinizing the latent causes of all those blights, blasts, rots, rusts, and mildews which so often destroy the choicest products of industry, and thereby impair the health, wealth, and comfort of millions of our fellow men. Let the professor of chemistry carefully analyze the various soils and products of the State, retain specimens, give instruction, and report on their various qualities, adaptions, and deficiencies.

Let similar experiments be made in all other interests of agriculture and mechanic or chemical art, mining, merchandise, and transportation by water and by land, and daily practical and experimental instruction given to each student in attendance in his own chosen sphere of research or labor in life. Expecially let the comparative merits of all labor-saving tools, instruments, machines, engines, and processes be thoroughly and practically tested and explained, so that their benefits might be at once enjoyed, or the expense of their cost avoided by the unskilful and unwary.

It is believed by many intelligent men that from one third to one half the annual products of this State are annually lost from ignorance on the above topics. And it can scarcely be doubted that in a few years the entire cost of the whole institution would be annually saved to the State in the above interests alone, aside from all its other benefits, intellectual, moral, social, and pecuniary.

The apparatus required for such a work is obvious. There should be grounds devoted to a botanical and common garden, to orchards and fruit-yards, to appropriate lawns and promenades, in which the beautiful art of landscape-gardening could be appropriately applied and illustrated, to all varieties of pasture, meadow, and tillage needful for the successful prosecution of the needful annual experiments. And on these grounds should be collected and exhibited a sample of every variety of domestic animal, and of every tree, plant, and vegetable that can minister to the health, wealth, or taste and comfort of the people of the State; their nature, habits, merits, production, improvement, culture, diseases, and accidents thoroughly scrutinized, tested, and made known to the students and to the people of the State.

There should also be erected a sufficient number of buildings and out-buildings for all the purposes above indicated, and a repository, in which all the ordinary tools and implements of the institution should be kept, and models of all other useful implements and machines from time to time collected, and tested as they are proffered to public use. At first it would be for the interest of inventors and vendors to make such deposits. But, should similar institutions be adopted in other States, the general government ought to create in each State a general patent office, attached to the universities, similar to the existing deposits at Washington, thus rendering this department of mechanical art and skill more accessible to the great mass of the people of the Union.

I should have said, also, that a suitable industrial library should be at once procured, did not all the world know such a thing to be impossible, and that one of the first and most important duties of the professors of such institutions will be to create, at this late hour, a proper practical literature and series of text-books for the industrial classes.

As regards the professors, they should, of course, not only be men of the most eminent, practical ability in their several departments, but their connection with the institution should be rendered so fixed and stable as to enable them to carry through such designs as they may form, or all the peculiar benefits of the system would be lost.

Instruction, by lectures and otherwise, should be given mostly in the colder months of the year, leaving the professors to prosecute their investigations, and the students their necessary labor, either at home or on the premises, during the warmer months.

The institution should be open to all classes of students above a fixed age, and for any length of time, whether three months or seven years, and each taught in those particular branches of art which he wishes to pursue, and to any extent, more or less. And all should pay their tuition and board bills, in whole or in part, either in money or necessary work on the premises - regard being had to the ability of each.

Among those who labor, medals and testimonials of merit should be given to those who perform their tasks with most promptitude, energy, care, and skill; and all who prove indolent or ungovernable excluded at first from all part in labor, and speedily, if not thoroughly reformed, from the institution itself; and here, again, let the law of nature, instead of the law of rakes and dandies, be regarded, and the true impression ever made on the mind of all around that work alone is honorable, and indolence certain disgrace, if not ruin.

At some convenient season of the year, the commencement, or annual fair, of the university should be holden through a succession of days. On this occasion the doors of the institution, with all its treasures of art and resources of knowledge, should be thrown open to all classes, and as many other objects of agricultural or mechanical skill gathered from the whole State as possible, and presented by the people for inspection and premium on the best of each kind; judgment being rendered, in all cases, by a committee wholly disconnected with the institution. On this occasion all the professors, and as many of the pupils as are sufficiently advanced, should be constantly engaged in lecturing and explaining the divers objects and interests of their departments. In short, this occasion should be made the great annual gala day of the institution, and of all the industrial classes, and all other classes in the State, for the exhibition of their products and their skill, and for the vigorous and powerful diffusion of practical knowledge in their ranks, and a more intense enthusiasm in its extension and pursuit.

As matters now are, the world has never adopted any efficient means for the application and diffusion of even the practical knowledge which does exist. True, we have fairly got the primer, the spelling-

book, and the newspaper abroad in the world, and we think that we have done wonders; and so, comparatively, we have. But if this is a wonder, there are still not only wonders, but, to most minds, inconceivable miracles, from new and unknown worlds of light, soon to break upon the industrial mind of the world.

Here, then, is a general, though very incomplete, outline of what such an institution should endeavor to become. Let the reader contemplate it as it will appear when generations have perfected it in all its magnificence and glory; in its means of good to man, to all men of all classes; in its power to evolve and diffuse practical knowledge and skill, true taste, love of industry, and sound morality - not only through its apparatus, experiments, instructions, and annual lectures and reports, but through its thousands of graduates, in every pursuit in life, teaching lecturing in all our towns and villages; and then let him seriously ask himself, is not such an object worthy of at least an effort, and worthy of a State which God himself, in the very act of creation, designed to be the first agricultural and commercial State on the face of the globe?

Who should set the world so glorious an example of educating their sons worthily of their heritage, their duty, and their destiny, if not the people of such a State? In our country we have no aristocracy, with the inalienable wealth of ages and constant leisure and means to perform all manner of useful experiments for their own amusement; but we must create our nobility for this purpose, as we elect our rulers, from our own ranks, to aid and serve, not to domineer over and control us. And, this done, we will not only beat England and beat the world in yachts and locks and reapers, but in all else that contributes to the well being and true glory of man.

I maintain that if every farmer's and mechanic's son in this State could now visit such an institution but for a single day in the year, it would do him more good in arousing and directing the dormant energies of mind than all the cost incurred, and far more good than many a six months of professed study of things he will never need and never want to know.

As things now are, our best farmers and mechanics, by their own native force of mind, by the slow process of individual experience, come to know, at forty, what they might have been taught in six months at twenty; while a still greater number of the less fortunate, or less gifted, stumble on through life almost as ignorant of every true principle of their art as when they began. A man of real skill is amazed at the slovenly ignorance and waste he everywhere discovers on all parts of their premises, and still more to hear them boast of their ignorance of

all "book farming," and maintain that "their children can do as well as they have done"; and it certainly would be a great pity if they could not.

The patrons of our university would be found in the former, not in the latter, class. The man whose highest conception of earthly bliss is a log hut in an uninclosed yard, where pigs of two species are allowed equal rights, unless the four-legged tribe chance to get the upper hand, will be found no patron of industrial universities. Why should he be? He knows it all already.

There is another class of untaught farmers who devote all their capital and hired labor to the culture, on a large scale, of some single product, which always pays well when so produced on a fresh soil, even in the most unskilful hands. Now, such men often increase rapidly in wealth, but it is not by their skill in agriculture, for they have none - their skill consists in the management of capital and labor; and deprive them of these, and confine them to the varied culture of a small farm, and they would starve in five years, where a true farmer would amass a small fortune. This class are, however, generally the fast friends of education, though many a looker-on will cite them as instances of the uselessness of acquired skill in farming, whereas they should cite them only as a sample of the resistless power of capital even in comparatively unskilful hands.

Such institutions are the only possible remedy for a caste education, legislation, and literature. If any one class provide for their own liberal education in the State, as they should do, while another class neglect this, it is as inevitable as the law of gravitation that they should form a ruling caste or class by themselves, and wield their power more or less for their own exclusive interests, and the interests of their friends.

If the industrial were the only educated class in the State, the caste power in their hands would be as much stronger than it now is as their numbers are greater. But now industrial education has been wholly neglected, and the various industrial classes left still ignorant of matters of the greatest moment pertaining to their vital interests, while the professions have been studied till trifles and fooleries have been magnified into matters of immense importance, and tornadoes of windy words and barrels of innocent ink shed over them in vain.

This, too, is the inevitable result of trying to crowd all liberal practical education into one narrow sphere of human life. It crowds their ranks with men totally unfit by nature for professional service. Many of these, under a more congenial culture, might have become, instead of the starving scavengers of a learned profession, the honored

members of an industrial one. Their love of knowledge was indeed amiable and highly commendable; but the necessity which drove them from their natural sphere in life, in order to obtain it, is truly deplorable.

But such a system of general education as we now propose would (in ways too numerous now to mention) tend to increase the respectability, power, numbers, and resources of the true professional class.

Nor are the advantages of the mental and moral discipline of the student to be overlooked; indeed, I should have set them down as most important of all, had I not been distinctly aware that such an opinion is a most deadly heresy; and I tremble at the thought of being arraigned before the tribunal of all the monks and ecclesiastics of the Old World, and no small number of their progeny in the New.

It is deemed highly important that all in the professional classes should become writers and talkers; hence, they are so incessantly drilled in all the forms of language, dead and living, though it has become quite doubtful whether, even in their case, such a course is most beneficial, except in the single case of the professors of literature and theology, with whom these languages form the foundation of their professions and the indispensable instruments of their future art in life.

No inconsiderable share, however, of the mental discipline that is attributed to this peculiar course of study, arises from daily intercourse, for years, with minds of the first order in their teachers and comrades, and would be produced under any other course, if the parties had remained harmoniously together. On the other hand, a classical teacher who has no original, spontaneous power of thought, and knows nothing but Latin and Greek, however perfectly, is enough to stultify a whole generation of boys and make them all pedantic fools like himself. The idea of infusing mind, or creating or even materially increasing it, by the daily inculcation of unintelligible words-all this awful wringing to get blood out of a turnip - will, at any rate, never succeed except in the hands of the eminently wise and prudent, who have had long experience in the process; the plain, blunt sense of the unsophisticated will never realize cost in the operation. There are, moreover, probably, few men who do not already talk more, in proportion to what they really know, than they ought to. This chronic diarrhœa of exhortation, which the social atmosphere of the age tends to engender, tends far less to public health than many suppose. The history of the Quakers shows that more sound sense, a purer morality, and a more elevated practical piety can exist, and does exist, entirely without it, than is commonly found with it.

Indeed, I think the exclusive and extravagant claims set up for ancient lore, as a means of disciplining the reasoning powers, simply ridiculous when examined in the light of those ancient worthies who

produced that literature, or the modern ones who have been most devoted to its pursuit in this country and in Europe. If it produces infallible practical reasoners, we have a great many thousand infallible antagonistic truths, and ten thousand conflicting paths of right, interest, duty, and salvation. If any man will just be at the trouble to open his eyes and his ears, he can perceive at a glance how much this evasive discipline really does, and has done, for the reasoning faculty of man, and how much for the power of sophistical cant and stereotyped nonsense; so that if obvious facts, instead of verbose declamation, are to have any weight in the case, I am willing to join issue with the opposers of the proposed scheme, even on the bare ground of its superior adaptation to develop the mental power of its pupils.

The most natural and effectual mental discipline possible for any man arises from setting him to earnest and constant thought about things he daily does, sees, and handles, and all their connected relations and interests. The final object to be attained, with the industrial class, is to make them thinking laborers; while of the professional class we should desire to make laborious thinkers; the production of goods to feed and adorn the body being the final end of one class of pursuits, and production of thought to do the same for the mind the end of the other. But neither mind nor body can feed on the offals of preceding generations. And this constantly recurring necessity of reproduction leaves an equally honorable, though somewhat different, career of labor and duty open to both, and, it is readily admitted, should and must vary their modes of education and preparation accordingly.

It may do for the man of books to plunge at once amid the catacombs of buried nations and languages, to soar away to Greece and Rome, or Nova Zembla, Kamchatka, and the fixed stars, before he knows how to plant his own beans, or harness his own horse, or can tell whether the functions of his own body are performed by a heart, stomach, and lungs, or with a gizzard or gills. But for the man of work thus to bolt away at once from himself and all his pursuits in after life contravenes the plainest principles of nature and common sense. No wonder such educators have ever deemed the liberal culture of the industrial classes an impossibility; for they have never tried nor even conceived of any other way of educating them except that by which they are rendered totally unfit for their several callings in after life. How absurd would it seem to set a clergyman to plowing and studying the depredations of blights, insects, the growing of crops, etc., in order to give him habits of thought and mental discipline for the pulpit; yet this is not half as ridiculous, in reality, as the reverse absurdity of attempting to educate the man of work in unknown tongues, abstract problems and theories, and metaphysical figments and quibbles.

Some, doubtless, will regard the themes of such a course of education as too sensuous and gross to lie at the basis of a pure and elevated mental culture. But the themes themselves cover all possible knowledge and all modes and phases of science, abstract, mixed, and practical. In short, the field embraces all that God has made, and all that human art has done; and if the created universe of God and the highest art of man are too gross for our refined uses, it is a pity the "morning stars and the sons of God" did not find it out as soon as the blunder was made. But, in my opinion, these topics are of quite as much consequence to the well being of man and the healthful development of mind as the concoction of the final nostrum in medicine, or the ultimate figment in theology and law, conjectures about the galaxy, or the Greek accent; unless, indeed, the pedantic professional trifles of one man in a thousand are of more consequence than the daily vital interests of all the rest of mankind.

But can such an institution be created and endowed? Doubtless it can be done, and done at once, if the industrial classes so decide. The fund given to this State by the general government, expressly for this purpose, is amply sufficient, without a dollar from any other source; and it is a mean if not an illegal perversion of this fund to use it for any other purpose. It was given to the people, the whole people, of this State - not for a class, a party, or sect, or conglomeration of sects; not for common schools, or family schools, or classical schools; but for "an university", or seminary of a high order, in which should, of course, be taught all those things which every class of the citizens most desire to learn - their own duty and business for life. This, and this alone, is an university in the true, original sense of the term. And if an institution which teaches all that is needful only for the three professions of law, divinity, and medicine is, therefore, an university, surely one which teaches all that is needful for all the varied professions of human life is far more deserving of the name and the endowments of an university.

But in whose hands shall the guardianship and oversight of this fund be placed, in order to make it of any real use for such a purpose? I answer, without hesitation and without fear, that this whole interest should, from the first, be placed directly in the hands of the people, and the whole people, without any mediators or advisers, legislative or ecclesiastical, save only their own appointed agents, and their own jurors and courts of justice, to which, of course, all alike must submit. It was given to the people, and is the property of the people, not of legislators, parties, or sects; and they ought to have the whole control of it, so far as is possible consistently with a due security of the funds and needful stability of plans of action and instruction. This control I believe they will be found abundantly able to exercise; and more than this no well-informed man would desire.

The reasons for placing it at once and forever beyond all legislative and ecclesiastical control are obvious to all. For if under the former it will continually exist as the mere tool of the dominant party, and the object of jealous fear and hatred of their opponents; or else it will become the mere football of all parties, to be kicked hither and thither as the party interests and passion of the hour may dictate. We well know how many millions of money have been worse than thrown away by placing professed seminaries of learning under the influence of party passion, through legislative control. And it is surely a matter for devout gratitude that our legislators have had wisdom enough to see and feel this difficulty, and that they have been led, from various causes, to hold this "Seminary Fund" free from all commitment to the present hour, when the people begin to be convinced that they need it, and can safely control it; and no legislator but an aristocrat or a demagogue would desire to see it in other hands.

The same difficulty occurs as regards sects. Let the institution be managed ever so well by any one party or sect, it is still certain their opponents will stand aloof from it, if they do not oppose and malign it for that very reason. Hence, all will see at once that the greatest possible care should be taken to free it from not only the reality but even from the suspicion of any such influence. Should the party in power, when the charter may be granted, appoint a majority of the board of trustees from the parties in the minority, it would show a proper spirit, and be, in all coming time, an example of true magnanimity, which their opponents could not fail to respect and to imitate, and which the people at large would highly approve. A victorious hero can afford to be generous as well as brave - none worthy of a triumph can afford to be otherwise. In all future appointments, also, the candidates should be elected with such an evident regard to merit, and disregard of all political and sectarian relations, as ever to carry the conviction that the equal good of the whole alone is sought. There can be no great difficulty in accomplishing all this, if it is well known in the outset that the people will keep their eye closely upon that man, whoever he may be, who, by any bargaining for votes, or any direct or indirect local, sinister, or selfish action or influence, or any evasion or postponement, or by any desire to tamper and amend merely to show himself off to advantage, shall in any way embarrass or endanger this greatest of all interests ever committed to a free State - the interest of properly and worthily educating all the sons of her soil. Let the people set on such a man, if the miscreant wretch lives, for all future time, a mark as much blacker than the mark set on Cain as midnight is darker than noonday. This is a question, above all others, that a man who is a man will desire to meet openly and frankly, like a man. Will our legislators do it? I, for one, believe they will. I shall not believe the contrary till it is proved; and I will even suggest, in general, a mode by which the great end may be safely gained. Let others, however, suggest a better one, and I will cheerfully accord with it.

Let the Governor of the State nominate a board of trust for the funds of the institution. Let this board consist of five of the most able and discreet men in the State, and let at least four of them be taken from each of the extreme corners of the State, so remote from all proximity to the possible location of the institution, both in person and in property, as to be free from all suspicion of partiality. Let the Senate confirm such nomination. Let this board be sworn to locate the institution from a regard to the interests and convenience of the people of the whole State. And, when they have so done, let them be empowered to elect twelve new members of their own body, with perpetual power of filling their own vacancies, each choice requiring a vote of two thirds of the whole body, and, upon any failure to elect at the appointed annual meeting, the Governor of the State to fill the vacancy for one year, if requested by any member of the board so to do. Let any member of the board who shall be absent from any part of its annual meetings thereby forfeit his seat, unless detained by sickness, certified at the time, and the board on that occasion fill the vacancy, either by his reelection, or by the choice of some other man. Let the funds then, by the same act pass into the hands of the trustees so organized, as a perpetual trust, they giving proper bonds for the same, to be used for the endowment and erection of an industrial university for the State of Illinois.

This board, so constituted, would be, and ought to be, responsible to no legislature, sect, or party, but directly to the people themselves - to each and every citizen, in the courts of law and justice, so that, should any trustee of the institution neglect, abuse, or pervert his trust to any selfish, local, political, or sectarian end, or show himself incompetent for its exercise, every other member of the board and every citizen at large should have the right of impeaching him before the proper court, and, if guilty, the court should discharge him and order his place to be filled by a more suitable man. Due care should be taken, of course, to guard against malicious prosecutions.

Doubtless objections can be urged against this plan, and all others that can be proposed. Most of them may be at once anticipated, but there is not space enough to notice them here. Some, for example, cherish an ardent and praiseworthy desire for the perfection of our common schools, and desire still longer to use that fund for that purpose. But no one imagines that it can long be kept for that use, and, if it could, I think it plain that the lower schools of all sorts would be far more benefited by it here than in any other place it could be put.

Others may feel a little alarm when, for the first time in the history of the world, they see the millions throwing themselves aloof from all political and ecclesiastical control, and attempting to devise a system of liberal education for themselves; but, on mature reflection, we trust they will approve the plan - or, if they are too old to change, their children will.

Professor Turner's truly broad educational philosophy conceived what he called the "industrial university". His concepts and visions, shared with other educational prophets of his day, became reality. Today we call it the "comprehensive university", and certain modern critics may disparagingly say "megaversity or multiversity". Nevertheless the comprehensive university is so much a part of the American Culture, offering an opportunity for higher education to all who may profit by it - not in the classical restricted sense but in the truly liberal sense espoused by Professor Turner. This truly liberal educator, knowledgeable to the dangers and limitations of conservative "liberalism" of the colleges of his day fought for and contributed to the developement of a new system of higher education - more influential in the civilized world than perhaps he himself might have dreamed. As the history of this unit of the Ohio State University is described, the struggle for dominance of Professor Turner's truly liberal concepts of higher education versus classical conservative academic "liberalism" is unmistakeable. So much so that from the beginning, the Ohio State University and what is now known as the Academic Faculty of Biochemistry and Molecular Biology have been adversely affected at times by too liberal amounts of academic conservatism.

III. THE FOUNDATION YEARS

The patterns of growth and traditions which develop in an institution are often determined by what happens in its early years. Early decisions and attitudes of those responsible for starting the Ohio State University did affect rather profoundly the growth of biochemistry in the decades to come. Certainly the lack of real commitment and sometimes even an understanding of the new philosophy of what a university should contribute to society is evident in these early years.

Almost from the date the Morrill Act was signed by President Lincoln, agricultural groups in Ohio saw it as an opportunity to fulfill their educational wants even though the various agricultural organizations showed considerable variation in the nature of their desires. But the church colleges of the state immediately considered the Morrill Act as a threat to their field of endeavor. They fought from the beginning a new university -- particularly a secular one supported in any way by public funds. So in the legislature these colleges made their position known in a concerted and highly organized manner. It appeared that they would essentially be happy only if the land grant funds could be distributed among themselves. Certainly they wanted no new competitive secular institution of higher learning. The legislature was sympathetic to agricultural interests yet the church groups were also strong, particularly in the cities. The rural communities had strong church ties too but felt an urgent need for educational opportunities. So the complex dilemna resulted in little constructive action by the legislature for several years during which time other states were getting started in their respective ways -- notably Illinois, Wisconsin, Michigan, and New York (Cornell) -- in establishing their land grant universities.

The debate and discussion continued in the agricultural, church and popular press until it seemed that the state might lose out by default because the legislature had not acted decisively beyond accepting the land script under the Morrill Act in February 1864, and setting up a mechanisms for selling the land script which when completed in 1868 only netted $340,900.80 on 629,920 acres. (New York had realized $4,144,568 through the wise management of Ezra Cornell).

It is a credit to the agricultural groups that they kept the issue alive. The State Board of Agriculture was active in this respect and also resisted moves to parcel out the funds among existing colleges. Dr. Norton S. Townshend, a long-time member and one-time president of this Board deserves much credit for his vision and preserverence. One of the early supporters and later a trustee of the proposed univer-

sity shook up the state with an article in the public press which crystallized the issue and resulted in positive action by the legistature. An attorney-at-law from Ironton, Mr. Ralph Leete, wrote as follows:

> "There are no intellects of high order in her (Ohio's) numerous colleges nor in any manner connected with her education system. Most of the professors in our literary institutions are better secretaries and not unfrequently narrow-minded politicians. As a class they are generally incompetent .... When society shall have attained a greater intellectual elevation the public instructors will rank with the jurists and statesmen of the country. The present want is such an institution as will breed thinkers and discovers of unknown truth, for it is essential truths in the concerns of life that constitute true progress ... For the improvement of Agriculture and Mechanical Arts we are indebted to Lord Bacon and Joseph Priestly more than to all who preceded them, yet neither was a farmer or so-called "practical" man ... It is men, not buildings or lands than can supply the knowledge that will promote the great interests of Agriculture and Mechanical Arts. The other scheme of dividing the fund between the State Universities (and/or church colleges) is equally objectionable (to narrow school for farmers and mechanics) -- for we have no State Universities. The object to be accomplished by an additional college of whatever name it may be called is moral and intellectual development, for that is the end of all educational instrumentalities."

The legislature found itself unable to reach decisions on the type of institution or the location of the Ohio Agricultural and Mechanical College. Under the guidance of Governor Rutherford B. Hayes, who was much interested in the new university, the legislature through two acts in 1870 decided to compromise these issues by leaving these decisions up to a Board of Trustees -- one member from each of the 19 congressional districts -- to be appointed by the governor.

The Board of Trustees came into being and, after much consideration of several possible location the present site of the university was selected.* Next, attention was given to the nature of the new university. After several meetings on this crucial issue, a climax was reached. Following two days of intensive discussion the Board of Trustees decided with only one dissenting vote for a broad based university. This decision took the form of adopting a report of a committee composed of Mssrs. Joseph Sullivant, Valentine B. Horton, Thomas C. Jones, John R. Buchtel and Dr. Norton S. Townshend to the effect that ten departments should be established as the foundation of the university. They were:

1. Agriculture
2. Mechanical Arts
3. Mathematics and Physics
4. General and Applied Chemistry
5. Geology, Mining and Metallurgy
6. Zoology and Veterinary Science
7. Botany, Horticulture and Vegetable Physiology
8. English Language and Literature
9. Modern and Ancient Languages and Literature
10. Political Economy and Civil Polity

Such an array of departments did indeed present a broad base for the new Ohio Agricultural and Mechanical College.

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* An interesting story, difficult to verify, about the site selection was told to a group of faculty including the author by the late Professor of Chemistry Charles W. Foulk. Professor Foulk, a fascinating story teller often "presided" at his favorite faculty club lunch table. As the site for the University was being considered so also was a site for the State Fair. Naturally Governor Hayes was interested in both. He urged the Fair commission to select its site directly east of the Neil farm location of the University, and he would ask the legislature to buy the intervening land and thereby assure that Ohio would be in position to develop an educational, research, and exposition center unequalled in the nation. Alas, Governor Hayes was unable to sell the legislature on the merits of his dream. Credence to the story is indeed given in the fact that the southern boundary of both was Eleventh Ave. Validity to Governor (and later President) Hayes' dream is seen in the new state museum now being constructed on this fairgrounds.

Next the Board concerned itself with building the necessary building to house and serve these departments. Their major monument to this phase of their early service is University Hall which, when it was built, was well out of the city on the university farm.

Once the building program was initiated the Board turned its attention to hiring a president and faculty so that instruction might begin in the fall of 1873. On January 2, 1873 a committee of the Board of Trustees recommended that in addition to the president then under consideration, the board should appoint professors of:

1. Agriculture
2. Physics and Mechanics
3. General and Applied Chemistry
4. Geology, Mining and Metallurgy

5. English and Modern Languages and Literature
6. Ancient Languages and Literature

This recommendation, apparently because of lack of resources, or for some unknown reason, omitted four of the ten posts originally agreed to. Dr. Townshend questioned the advisability that professorships of English and Modern Languages and Literature and of Ancient Languages and Literature should take precedence over Mathematics, Mechanical Arts (Engineering), Zoology and Veterinary Science; Botany, Horticulture and Vegetable Physiology; and Political and Civil Polity so important as the foundation to agriculture. Accordingly he entered a motion to delete the professorships of English and Modern Languages and Literature and Ancient Languages and Literature from the committee's recommendation. A heated debate ensued. Finally a vote was taken and Dr. Townshend's motion lost 8 to 7 with 4 of the trustees either absent or not voting. Three months later, after the Board's second major candidate for the presidency had declined their offer, Professor Edward Orton, Sr., of Geology, Mining and Metallurgy accepted the dual assignment of President and this permitted the appointment of a Professor of Mathematics and Engineering.

It is this 8 to 7 vote that has been labeled through the Ohio State University's history as the great vote for the "broad gauge" or "liberal" view of the university. In retrospect and in reality it was quite the opposite. Indeed a few years later one of the majority of eight, Judge T.C. Jones, said the University "had got as far as possible away from God and agriculture." Certainly this decision could hardly coincide with the philosophy of Professor Jonathan Baldwin Turner. It was bad for public relations because agriculture and the mechanic arts were deflated and the institution aborning immediately appeared to be competitive with the established colleges of the state. The legislature did not appropriate anything for the university until 1877 when it directed that a School of Mines and Mine Engineering be organized with the sum of $4500. In the meantime, the legislature had reorganized the Board of Trustees three times and it would be almost 20 years before the legislature would institute annual appropriations to support its university.

Dr. Townshend though defeated 8 to 7 acceded to the Board of Trustees' request in that fateful meeting that he resign and accept the Professorship of Agriculture although he must have known what a difficult, almost impossible, position he was accepting. Certainly he must have done so to keep alive his dream of a university to serve agriculture. After all, almost 20 years before he and three other eminent scholars had attempted to establish an agricultural school near Cleveland. These other men were Professors James H. Fairchild and James Dascomb of Oberlin and Dr. John S. Newberry. Professor Fairchild became a long time President of Oberlin College and Dr. Newberry, an eminent paleobotanist, was elected president of a number of professional societies,

was honored in England and was an incorporator of the National Academy of Sciences. Professor Townshend, already 58 years old, was reared on an English farm and migrated with his family to an Ohio farm. His father was an Oxford graduate and had an extensive library famous throughout Ohio. He was educated as a physician and surgeon in the U.S.A. and in Europe, and practiced this profession while becoming an influential spokesman and leader of the agricultural interests of the state. He was elected to several terms in the legislature and to Congress for one term and served on a number of state and national commissions.

At the age of 58, when many think about retirement, Dr. Townshend was to become a teacher -- a professor of agriculture, an area of knowledge with almost no pedagogical history. Furthermore he had to accept the initial responsibility of teaching all other biological sciences. As if that were not enough he was assigned by the Board of Trustees the responsibility for running the university farm for teaching, experimentation and to make money for the college. No man, not even Professor Townshend, was able to do all these things. Consequently, the university farm did not suddenly become an example for Ohio farmers to copy. Then too, Professor Townshend's teaching was less than ideal because of the responsibility of so many of the older classical biological disciplines and the new uncharted field of agricultural education. In 1874 a professor of Zoology and Comparative Anatomy was added. Even so, such a situation in the university brought much criticism from agricultural interests.

At the outset the new faculty decided to admit as students only those graduates of the "common" school (high school) who had studied algebra or those who could pass a rigorous examination. Twenty-five students were admitted and twenty were rejected by examination. Because of the structure of the Ohio school system most potential students from the rural areas and smaller communities were excluded. Because of the early admission policy the number of students was low and continued to be so. In 1877, the Board of Trustees ordered the elimination of algebra as a requirement to enter and immediately enrollment went up 77%, still mostly graduates of city schools.

Thus potential friends of the university from the agricultural community were alienated. The other colleges of the state were still influential and the new university had trouble a plenty. The strategy of trying to shame legislators into supporting their university of their wealthy state by pointing out that less wealthy states were supporting their universities in far better manner did not seem to produce results anymore then than it does now. In view of the difficulties the university was experiencing and the antipathy of many legislators, university officials and legislators did visit the University of Illinois and were reportly very impressed by that state's progress in building its university -- a library with 11,000 volumes, laboratories, museums, classrooms, well cared for farms and agricultural experiments, etc. Based on this

commission's report an appropriation was made by the legislature in 1878 for $15,800.00 - more than all other previous appropriations combined.

By 1877 the Board of Trustees did become concerned about the poor condition of the University farm and hired Mr. Charles E. Thorne as farm foreman who was soon promoted to Superintendent because of his effective work. After a few years he resigned because of poor salary. Mr. Thorne later reported that when he took over the farm the only working capital was that privately supplied by Professor Townshend and that the equipment, livestock and supplied were extremely limited and of minimum quality.

Even with Mr. Thorne's assistance with the farm, Professor Townshend was still obliged to direct all activities of the farm, carry an excessive teaching responsibility for the botanical and veterinary sciences as well as agriculture, and try to get more students from the rural areas. He tried developing short courses in agriculture to attract more interest and support for the University because, as the early curriculum and admission policies were set up, students from the agricultural areas needed at least six years to complete a degree. Agricultural groups were further alienated when the name of the Ohio Agricultural and Mechanical College was changed to the Ohio State University, a move not instigated by President Orton or the Board although they were in accord. At about the same time the department of Political Economy and Civil Polity was dropped and Geology, Mining and Metallurgy, President Orton's responsibility, was reorganized to form a separate department of Mining and Metallurgy and nothing had been done to add staff in veterinary science and entomology areas, so important to agriculture. At the time new staff had been added in languages and a new department of Free-hand and Mechanical Drawing had been formed. Shortly after, in 1879, the Department of History and Philosophy was established.

The Board of Trustees in 1880 were aware of the continuing and often intense criticism leveled by the agricultural interests and some legislators at the University. It was not difficult to see that students were not coming from rural areas even for the short courses attempted by Professor Townshend. There was a feeling in the Board that Professor Townshend was to blame and so a committee of the Board was selected to secure the resignation of Professor Townshend, who was by then in his 65th year. But Professor Townshend, who felt that indeed his recommendations for agriculture had not been followed, characteristically defied the Board. A member of the committee related that Professor Townshend told them, "to go back and attend to their proper duties or he would have them (the Trustees) removed." And the committeeman reported that "he could have done it", because Professor Townshend was an extremely popular man among legislators and the agricultural community.

A number of Board actions, minor as well as more important ones, are recorded to indicate a realization on their part that perhaps they had indeed neglected the needs of the agricultural sector of the state.

Shortly after the Board's attempt to fire Professor Townshend, they agreed to send him on a study tour of a number of agricultural institutions of diverse types and to report his findings to the Board. Chosen were the Illinois Industrial University (University of Illinois), a comprehensive university; Michigan Agricultural and Mechanical College (Michigan State University), with a limited program; Agricultural College of the Province of Ontario; and the Veterinary College of Toronto. All of these institutions enjoyed excellent reputations, with Michigan being the oldest school having been organized prior to the Morrill Act. Professor Townshend reported to the Board in great detail informally so that the detailed report would not be a part of the official record, "for obvious reasons".

In summary, Professor Townshend reported that the College of Agriculture at Illinois had three departments, each with full professors and assistants -- Agriculture, Horticulture, Veterinary Medicine. All students took theory and practice in these areas plus courses in geology, botany, zoology, entomology, meteorology, mathematics, mechanics, English and chemistry. The Chemistry department in the College of Literature and Science teaches chemistry as it applies to agriculture. (Through the years Illinois' Department of Chemistry has had strong programs in biochemistry resulting from this early teaching responsibility. This situation is unique in most land grant colleges for generally chemistry departments excluded biochemistry). Illinois had a stock farm of 410 acres and an experimental farm of 180 acres with $25,000 for capital equipment. The Professor of Agriculture had control of all experiments, but business and records of the farm were kept by the farm manager who was paid $1200 a year, plus a house, cow, etc. The Department of Horticulture, including botany and entomology also had a $25,000 capital fund for greenhouses, etc. and were assigned space on the experimental farm. Veterinary Medicine had a stable and free veterinary clinics for teaching purposes. Michigan organized in 1857 and since controlled by the Michigan Board of Agriculture had 676 acres. "The training given in this college is intended to include whatever is required to make of the citizen an intelligent farmer, also what is needed to make of the farmer an intelligent citizen". The branches of learning taught were geology, chemistry, botany, horticulture, landscape gardening, meteorology, astronomy, comparative anatomy, comparative and human physiology, entomology, mathematics, civil engineering, all with reference to agriculture. In addition, students studied English literature, logic, constitutional law, ethics, political

political economy and military science.

Following the report of his visit, Professor Townshend recommended to the Board of Trustees that they quickly fulfill the needs of agriculture by providing:

1. A Botany and Horticulture Department
2. Farm manager and suitable farm for illustration and research
3. Veterinary Science Department
4. Entomology Department
5. Application of Chemistry to agriculture.

"Agricultural Chemistry has not been made a part of agricultural course as it ought to be. Chemistry is probably taught as well at the Ohio State University as anywhere in the whole country but the practical uses of chemistry to the farmer and the practical methods of analysis are not taught to the agricultural classes. (Professor of Chemistry Sidney A. Norton did not believe much in laboratory instruction, particularly at the elementary level. F.E.D.) The third term of the second year could be occupied with agricultural chemistry instead of veterinary anatomy.

"I respectfully submit that until the additions and changes I have indicated are made it is useless to expect the farmers of Ohio to take any considerable interest in the State University. Asking them to patronize this institution by sending their sons, their reply in numerous instances has been the same as that frequently made last winter by members of the legislature when asked for appropriation. 'Your School', they would say is not such an agricultural and mechanical college as the law of Congress requires and your agriculture department is neither half-manned nor half furnished. The University is doubtless a very nice institution for the young men and young ladies of Columbus, but it is not an agricultural college as the people of the state expected to see."

The Board, although pleased with the Farm Superintendent's work, refused Mr. Charles E. Thorne's raise in salary to $1,000 from $420 and asked Professor Townshend to reassume these duties of farm manager, etc. Townshend adamantly "refused to assume these duties assigned to him". The Board then urged Mr. Thorne to reconsider at a salary of $900 per year until April 1882. He did carry on until October 1881, when he became associate editor of "Farm and Fireside" an influential farm paper.

President Orton's resignation originally offered in 1878 was finally accepted in 1881, but he retained his professorship of Geology. Walter Quincy Scott was elected to the presidency at that time.

This year the Board of Trustees also acted on one of Professor Townshend's major requests and appointed W. R. Lazenby of Cornell University as Professor of Botany and Horticulture. Professor Lazenby, age 29, immediately made ambitious requests for facilities which were ignored by the Trustees whereupon Professor Lazenby went directly to the legislature because he felt that the legislature might be more receptive. Indeed they were and granted Professor Lazenby's request to form an Agricultural Experiment Station at the University, but to be administered by a separate Board of Control. He was supported by the State Board of Agriculture and the State Grange and "it was one of the many instances showing distrust of the Board of Trustees and faculty by the farmers of the state". When the bill was under consideration in the legislature the Board of Trustees, backed by Governor Charles Foster, had fought to have the new Station put under their jurisdiction but this modification was voted down by a large majority. The humiliated Board became hostile at first but cooler heads prevailed and a cooperative arrangement was worked out whereby Professor Lazenby was to be Director of the Experiment Station as well as Professor of Horticulture in 1882. The Station thus embarked on its stormy decade at the University which ended tragically when the Station left the campus for Wayne County -- a grave loss to the University for the continuing research budget of the agricultural experiment stations made it possible in other states to establish the philosophy and tradition of research in their Land Grant Universities. Thus other states had a strong focal point around which to build their graduate schools and, including particularly, biochemistry programs.

The board continued on its plan to try to fulfill Professor Townshend's requests by establishing a professorship of agricultural chemistry. One of the most devoted and capable trustees, Mr. Lucius B. Wing, Newark, is given credit for this and other moves to improve the university. He was appointed in 1881 and served 20 years, 19 on the Executive Committee. He had served on the State Board of Agriculture and when appointed was criticized and labeled as a man with a narrow view of what the University should be. His colleagues and critics came to know otherwise some years later when Mr. Wing's capabilities avoided what appeared to be a disaster for the University. Ex-President Rutherford B. Hayes, a Trustee and long-time friend of the University, remarked "What a splendid thing it is to have a man like Mr. Wing on this Board of Trustees." His death in 1902 was mourned officially and unofficially by trustees, faculty and students.

The term of office of new President Walter Quincy Scott was short because friction soon developed between him and the Board. For one thing he refused to have chapel. His educational goals at times were at odds with those of the trustees. Often his public speeches on economic development appeared to irritate many listeners, particularly farmers and other property owners. He appeared in his own actions unsympathetic with

the formation of a department of agricultural chemistry even though his official reports approved the idea. At the end of his second year he was fired by the Trustees. This caused quite a controversy because of his popularity among students and some faculty. At the insistance of the Governor, the Board was requested to publicly justify its action which led to published exchanges between President Walter Q. Scott and the Board. In this the Board noted:

"1. He would not conduct chapel
2. Promulgated unsound and dangerous doctrines
3. Neglect of duty in withholding communications sent to the Board through him
4. General lack of executive ability.

"Specifications on the third charge was that he retained the application of an eminent person for appointment to the chair of Agricultural Chemistry which the Board desired to establish until his (the applicant's) services were secured elsewhere." The applicant referred to was Professor Henry P. Armsby of the Connecticut Agricultural Experiment Station who went to the University of Wisconsin as Chairman and Professor of Agricultural Chemistry".

The Board selected William Henry Scott of Ohio University of Athens as President under difficult circumstances in 1883, made even more difficult by the Board itself when it became known that initial appointment was "pro tempore" and President Scott rightfully expected more support than that and insisted on removal of the label. President Scott did well and held the post for 12 years although he had tendered his resignation several times beginning in 1887 because of differences with or lack of support of the Board, no doubt partly due to difficulties attendant on his assumption of the Presidency of the University. In 1893 the Board finally conditionally accepted President Scott's resignation but two years were required to find his successor in President James Hulme Canfield. On President Canfield's inauguration, President Scott became Professor of Philosophy.

At the onset President William H. Scott came to grips with the problems left to him and he was more keenly attuned to the attitudes of the legislature with respect to the University. He immediately set about in 1883 to establish the Department of Agricultural Chemistry in accordance with the wishes of the Board. Soon thereafter, President Scott recommended in 1884 that Zoology and Comparative Anatomy be split to the Department of Zoology and Entomology and Department of Comparative Anatomy, Veterinary Medicine and Surgery. These changes were indeed in line with Professor Townshend's recommendations so forcefully presented to the Board of Trustees in 1880.

A search immediately began in 1883 to find a professor of agricultural chemistry and by mid-1884 the Board appointed Professor of

Chemistry Henry Adam Weber of the University of Illinois to the post but not without some debate.

The Ninth Annual Report of the Board of Trustees in 1879 records that on the recommendations of the Faculty the following degrees were awarded during the year:

Ph.D., (in course) Prof. H. A. Weber of Illinois
Ph.D., (honorary) Prof. John B. Peaslee of Ohio
B.A., Warren H. Noble
B.S., J. Scott Humphrey
Amasa B. McMackin
Mary F. Morrison
Henry Schneider, Jr.
Robert S. Townshend (son of Prof. Townshend -F.E.D.)
LL.D. (Honorary) Hon. Allen G. Thurmond
Hon. Morrison R. Waite

The record is not clear as to the work of Professor Weber which earned the degree. He had worked for the Ohio Geological Survey prior to going to Illinois and was certainly known by President Orton and obviously had gained some measure of a scientific reputation.

Cope in his history of the early years of the University notes as follows concerning the Board's selection of the first professor of this department:

"He was Professor Henry Adam Weber; Professor Weber had attended common schools of Franklin County, Ohio and had studied for two years at Otterbein University 1861-1863 and had attended the Polytechnic School at Kaiserlauten, Germany, 1863-1866, where he graduated and the University of Munich 1866-1868. He received the Ph.D. from the Ohio State University in 1879, was assistant chemist of the Ohio Geological Survey from 1869-1874, professor of Chemistry in the University of Illinois from 1874-1882, and during which time had been a chemist of the State Board of Health for that state and was a member of a number of learned societies.

"While professor of chemistry at Illinois, he invented a process for making sorghum which promised to work a revolution in the manufacture of sugar for which he secured a patent. This process gave every indication of being valuable and the Trustees claimed an interest in the patent." This claim and Weber's refusal led to a bitter controversy and he resigned at Illinois.

"When he was being considered by the Board of Trustees (Ohio State University) this trouble was brought up against him, when L.B. Wing, one of the Trustees, disposed of it by saying, 'If a member of the faculty

of the Ohio State University should discover some useful process or invention, I, for one, would vote to award him a premium for it instead of trying to take it away from him.'"

Professor Weber was hired through resources of the University and Experiment Station and during his first years at the University he was to serve periodically as chemist for the Ohio Agricultural Experiment Station and as Farm Manager.

A review of reports in these years reveal the friction between the Ohio State University and the Ohio Agricultural Experiment Station. This did affect the new department of agricultural chemistry, particularly by providing resources for its early research efforts. However, shifting responsibilities of Station, University and Department created problems for the new Department of Agricultural Chemistry.

It will be recalled that through Professor Lazenby's efforts the Station was founded by action of the State Legislature. On the national level there was increasing interest for federal support for agricultural research in a manner somewhat analogous to federal support for Land Grant universities authorized under the Morrill Act. In 1887, Professor Townshend and Mr. Wing went to Washington to urge Congress to pass the Hatch Act. This law would greatly contribute, through its research funds, to the development of scientific agriculture and at the same time create an atmosphere of research in the universities. Time was to show that Hatch Act funds did indeed contribute significantly towards graduate education as we know it today. Cornell, Wisconsin, Minnesota, Illinois, California and Yale did develop outstanding biochemistry programs from significant Hatch Act support very early in their growth simply because biochemistry (agricultural chemistry) was fundamental to almost all phases of agricultural research as it was later found so basic to medical research. But alas, this was to be denied to Ohio State University. For while Professor Townshend and Mr. Wing were in Washington to work for passage of the Hatch Act, so also, unbeknown to them was Mr. J.H. Brigham, head of the Ohio State Grange. Through congressional friends Brigham succeeded in getting the Hatch act amended in a seemingly innocuous manner. The amendment would permit Hatch Act funds to go to Experimental Stations not affiliated with the State Universities and would not require Experiment Stations to be a part of the University in states already having agricultural experiment stations independent of the state universities. When the Ohio legislature took up the matter of making Ohio eligible for participation in the federal experiment station program the anti-university sentiment flared anew. The Grange opposition was highly organized and the agricultural press made its position clear. The result was the Terrell resolution delegating Hatch Act support to the Station and stipulating that State and University be maintained separately under different controlling boards. It was passed by the catastrophic majority of almost 9 to 1 against the university position on March 16, 1887.

The University Board of Trustees were understandably depressed after having done what they considered a good job for agriculture. They had initiated and rapidly executed many improvements for agriculture following the attempt to fire Professor Townshend in 1880. The Board had made it possible for Professors Townshend and Lazenby to participate in the Farmer's Institutes sponsored by the Grange. Both were effective and popular speakers and the image of the University began to change in the agricultural community and the influence of the Grange became stronger at the same time. But it was too late.

The fight in the legislature was bitter. Capt. Alexis Cope, Secretary of the Board of Trustees, in the heat of the battle in trying to better understand the animosity of the agricultural interests wrote to two of Ohio's most influencial writers, Mr. W. I. Chamberlain, former member of the State Board of Agriculture, former editor of the Ohio Farmer and at that time president of Iowa State College, and Mr. Charles E. Thorne, associate editor of "Farm and Fireside" and former Superintendent of the University Farm who shortly was to become Director of the Ohio Agricultural Experiment Station. Thorne's reply was very pointed and essentially reiterated the church college criticisms of the University and his conviction that the University should be reorganized as a two year agricultural school dropping science and classics. He cited the programs of Michigan and Kansas but ignored much more successful University of Illinois.

The fight over the Terrell resolution did indeed threaten to expand to university reorganization directly in the legislature but this was arrested by Mr. Chamberlain's reply to Secretary Cope published in the Ohio Farmer. Admitting that once he was "a thorn in the flesh of the University", Mr. Chamberlain gave a lucid and eloquent defense for every member of the Board of Trustees and urged the farmers to cool it, cooperate and work for their goals by evolution and admonished the agricultural groups: "Reorganization (in the legislature - F.E.D.) means disorganization and disorganization means cessation of healthy growth, if not life itself. But the farmers may well work upon and through this Board and year by year let their wishes be clearly stated to the Governor before he appoints new members of the Board."

Following their defeat the Trustees did work out an agreement for cooperation with the Board of Control of the Station. But it was short lived and the Station left the campus in 1891 -- the same year Professor Townshend retired in his 76th year. The programs of the University and Station drifted apart even though they had some common board members. Because of this, research activities so important in graduate education in many departments of the college diminished sometimes almost to the point of disappearance, and the stimuli of a continuing supply inquiring graduate students working as research assistants was lacking at the

Experimental Station. It was not until Mr. Leo L. Rummell, former member of both boards, former editor and leader in the agricultural and business communities became Dean of the College of Agriculture and Director of the Ohio Agricultural Experiment Station in 1947 that much was done to bring University and Station back together. Dean and Director Rummell until his retirement in 1960, worked diligently to bring them together in their programs of research and teaching, even he could not bring them together physically. Since then, unfortunately, a number of events have tended to separate the College of Agriculture of the University and the Experimental Station from the mainstream of the University itself.

Up until 1884 the legislature more often than not ignored the University in its appropriations and that year was a notable one for the University and for this department. For the first time from general state funds, the legislature appropriated any money for general expenses of the University --$10,000 for salaries and supplies. In its appropriation the legislature further stipulated that a department of agricultural chemistry be established at the University and that $2,500 of the remaining $15,500 for a number of specific purposes be used for the laboratory of the department.

Poor legislative support ranging from indifference to, at times, open hostility, particularly in the early days, greatly hampered the establishment of a strong university in spite of support by a number of influential friends. Another important legislative year for the University was 1891 primarily because of the Hysell Act which provided that 1/20 of a mil property tax should be set aside for the University on a continuing basis. Furthermore the Board of Trustees were authorized to borrow against this anticipated income. For the first time it became possible to plan ahead for university growth. Townshend, Orton and Hayes halls were soon planned and built. Even so there was still no appropriations from the state general funds for current running expenses. The adoption of such a general legislative policy had to wait until after the turn of the century even though some specific appropriations were made such as the rebuilding of the burned chemistry building on two different occasions.

Besides lack of financial support another legal block by the legislature became significant. This was the salary limit imposed on the faculty and administrative officers. Recruiting a replacement for President William H. Scott was very difficult and some of the younger potential leaders left the University. One such was Professor Thomas Forsythe Hunt, who suceeded Professor Townshend, Professor Hunt was an imaginative and dynamic leader who graduated from Illinois in 1884, stayed on the staff there until 1891 and was briefly at Pennsylvania State College before coming to the Ohio State University in 1892. He became Dean of the College of Agriculture in the reorganization affected by President James Hulme Canfield in 1896 and went to Cornell as Dean in 1903 at twice his Ohio State University salary.

Even with the Hysell Act in 1891, there were latent attitudes of distrust of the University in the legislature which flared anew upon Professor

Townshend's retirement. He was truly revered by agricultural interests. He had indeed served the University diligently and under trying circumstances since the beginning. The Board of Trustees with their limited resources voted Professor Townshend an annual pension of $1,000. In spite of his age of 75, the Board was criticized for dumping and inadequately paying off Dr. Townshend whose salary was always $2,500 per year. It is reported that Senators Whittlesy and Hogg came to the Board and demanded that they pay Professor Townshend more whether or not it was legal.

Some of the legislatures of the 1890's did seem to develop more interest in the University and in 1900 treated the University well. But the rivalry and direct opposition by the church colleges continued and it reached a climax in 1902 when the University asked the legislature to support the establishment of a College of Education on the campus. The church colleges, plus Ohio and Miami Universities presented a well-organized opposition in the legislature with President Bashford of the Ohio Wesleyan University as their spokesman. He pleaded that the College of Arts of the Ohio State University should be abolished and that it was not needed and that it duplicated other schools. Furthermore, he requested that Ohio State University be required to stick to specialized and perhaps graduate education.

The fight continued for four months and finally the University accepted a compromise granting only a portion of what had been requested. Afterwards, it was discovered that one of the state universities had really lead the highly organized opposition behind the church college front. The details came to light in the smouldering aftermath of the bitter contest. This led the legislature to declare that Miami University and Ohio University should henceforth be supported only as classical arts colleges and normal schools and that there should be only one state university, The Ohio State University.

IV. THE FORMATIVE YEARS

In 1883, ten years after the first class entered, a Professorship of Agricultural Chemistry was established at the University by the Trustees. This was the second move, following the establishment of the Professorship of Horticulture and Botany, to augment the teaching program of the basic areas related to agriculture as had often been requested by Professor Townshend. He had very forcefully presented these requests again to the Trustees in 1880 in a formal manner following his inspection trip to other universities occasioned by the Board's attempt to retire him. In this report he had favorably referred to the way chemistry was taught with respect to agriculture at the University of Illinois and the lack of this point of view as well as the deficiency in laboratory instruction at the Ohio State University. By the time classes began in the fall of 1884 a 39-year-old former Professor of Chemistry of the University of Illinois, Henry Adam Weber, was ready to meet his classes as Professor of Agricultural Chemistry.

Professor Weber had a profound influence on the educational programs both in agriculture and in chemistry in the developing university for he brought a somewhat different philosophy of education and spirit of research which not only could stimulate discussion and change but occasionally could irritate conservative and classical educators as well. He was at times a crusader and was convinced that the science and profession of chemistry could and should be applied to serve the public interest. Inevitably, such a man in 28 years would leave his mark on the University.

Born in 1845 in Franklin County, Weber attended the common schools here and then studied at Otterbein College from 1861-63 in the scientific course and then went to Kaiserslautern, Germany, where he enrolled in the Polytechnic School in 1863 and graduated in 1866 at the age of 21. For the next two years he studied at Munich with von Kobell in Mineralogy, and Reischner and von Liebig in Chemistry, Professor Justus von Liebig made a very great impression on young Weber as he did on all of his students. Liebig was a great champion of state financed higher education and research in the support of agriculture and exerted international influence. In fact, the concept of the American Land Grant University is similar to Liebig's ideas and some scholars consider that Liebig did indeed influence the establishment of the land grant universities and particularly agricultural experiment stations.

The research of Liebig and his students really set the standard for academic research in chemistry and made fundamental contributions to the study of the chemistry of biological systems which later came to be known as the modern discipline of biochemistry. Liebig is recognized the world over among scientific educators for it was he who developed the basic philosophy of modern education in the sciences emphasizing the laboratory

experiment as the basic teaching tool. Weber was under Liebig's influence during the most formative years of his professional career. These must have been exciting years for Weber since the great Liebig was at the pinnacle of his career and his laboratory was the focal point of many pioneering developments and discoveries as well as of scientific controversy. It is small wonder that Weber developed a reverent admiration for Liebig such that he had a portrait made of his teacher and this hung for many years in main lecture room of the Department. A sort of scepter for chairmen of this department was one of Weber's burettes, hand made in Liebig's laboratory in 1869, because Liebig's students had to make most of their own glassware.

On Weber's return to the United States he joined the Ohio Geological Survey in 1869 and remained until 1874. There is no record of his being considered for a professorship of chemistry as the first faculty was being selected for the Ohio State University. This is a bit surprising since Liebig's students were eagerly sought by the new state universities. Weber must have been known to the trustees for he was with the Ohio Geological Survey at the time President-to-be Orton was there. Just after the first class was admitted to OSU, Weber left the Ohio Geological Survey to become, in 1874, Professor of Chemistry at the Illinois Industrial University (University of Illinois).

Weber must have impressed his colleagues at Illinois for the minutes of the Ohio State University faculty for March 6, 1878, show: "Request was presented from the Illinois Industrial University asking the college to confer the Ph.D. on Prof. Weber of that institution. Consideration postponed. Committee on diplomas asked for longer time." The faculty minutes for March 20, 1878, reads as follows: "After discussion the faculty resolved that the President shall notify Pres. Gregory of the Illinois Industrial University that upon presentation of a satisfactory thesis the faculty would recommend to the Trustees that the degree of Ph.D. be conferred upon Prof. Weber of the aforesaid institution."

Prof. Weber must have presented a thesis but none has been found nor is there any record even of its title but the faculty minutes of May 15, 1879, recommended to the Board of Trustees that the Ph.D. be conferred on Professor Henry Adam Weber. The minutes of the Board Trustees shows the approval of the "Ph.D. (in course)" for Professor Weber of Illinois along with one Ph.D. (honorary) and two LL.D.s (honorary) and the bachelors degrees for the graduating seniors. Thus the first earned doctorate conferred by the Ohio State University was awarded in June 1879 to Henry Adam Weber who five years later was to become its first Professor of Agricultural Chemis

Professor Weber had a keen interest in research and in a chemical approach to the solution of many problems usually not thought of in his time as chemical problems. His teaching reflected these interests. As one might expect in such a pioneering professor he was concerned about professional

development. He was a charter member of the American Chemical Society (April 6, 1876) and was the only Ohio State University faculty member to be a member of the Society until his student William McPherson joined in 1894. The very first volume of the Journal of the American Chemical Society has a contribution from Professor H.A. Weber, "Note on Arragonite", 1 79 (1879). He was also interested in the Association of Official Agricultural Chemists and this reflects his interest in public health problems. At Illinois he had responsibility to the Board of Health of that state as its chemist. There and on his return to Ohio he was interested in water supply problems. Among his students were the Hoover brothers who became water and sewage superintendents for Columbus and who contributed so much to modern water and sewage treatment systems for cities throughout the U.S.A. He developed a concern for food adulteration and became an active proponent of pure food laws. These interests, as we will see, were also in evidence in the research and theses of his students.

Professor Weber was a proponent of graduate education and of students actively doing research but the Ohio State University Graduate School would not formally get underway until the year of his death in 1912 with Prof. William McPherson, who published his own doctoral research with Professor Weber, as Dean. (J. Am. Chem. Soc. 17 312-321, 321-327 (1895).

Professor Weber had been at his new duties only a few months when his first annual report was due. So his own words describe the beginning:

"W. H. Scott, President, Ohio State University

Sir: The undersigned would respectfully submit the following report of the Department of Agricultural Chemistry for the fall term 1884. Of the rooms in the chemical laboratory which have been assigned to this department only two, those recently occupied by the officers of the experiment station, are finished. In the largest, one of the temporary desks has been fitted up for my students and myself. The apparatus, reagent bottles and reagents were kindly loaned to this department by Prof. Norton (Chemistry). It was found necessary to purchase a small number of salt mouth bottles to contain the material for work, as well as a few of the more common salts. The smaller room serves as a recitation room, store room, and balance room. The laboratory fee collected from the students in this department for the present term is $ 8.00 as the laboratory practice embraces only eight hours per week, instead of ten, the other two being devoted to lectures and recitations. The undersigned, therefore, recommends that the fee for this department may be fixed at $8.00 per term.

Very respectfully,
H. A. Weber

Columbus, Oct. 25, 1884."

Even though facilities and supplies were meager, it is clear from the beginning that laboratory instruction was to be an important part of the courses of the new department-eight hours per week in the beginning courses.

During the first year of his tenure Professor Weber served also as Chemist for the Agricultural Experiment Station and "shall conduct such analytical investigations as may be laid out for him by the Director."

The 14th annual (1884) report of the University lists 146 preparatory students (high school level) and 152 regular students in the following categories; Arts 39; Philosophy 24; Science 30; Agriculture 3; Civil Engineering 29; Mining Engineering 10; and Mechanical Engineering 17.

An idea of the direct financial support of the various laboratories at that time is found in the 15th Annual Report, 1885: Geology $100, Chemistry $800, Mechanical Engineering $75, Mining and Metallugry $160; Physiology and Zoology $1000; Civil Engineering $200; Physics $885; Agriculture $100; Horticulture and Botany $300; Pharmacy $200; Agricultural Chemistry $150, and Mathematics and Astronomy $30.

During the 1884-85 school year Professor Weber reported that he taught 4 students in the fall term; 4 in the winter; 3 in the spring; 2 special advanced students in veterinary materia medica and 17 short course students in the fall, 13 in the winter, and 11 in the spring. He noted that for the fall course the lectures were devoted to the elements of chemistry and the chemistry of non-metals; for the winter, organic chemistry; and for the spring, applications of chemistry to agriculture. In the laboratory qualitative analysis was taught fall and winter terms and the spring term was given over to the quantitative analysis of salts, minerals, manures, fertilizers, water and feeding stuffs. It is of interest to note that the teaching of qualitative analysis to beginning students lost favor among teachers of chemistry during the first half of the twentieth century but this approach to teaching freshman chemistry laboratory has in the past two to three decades again come into favor.

The university's 3 year pharmacy program started the previous year with 10 students, and 15 students were added in 1886 according to President Scott's report. He noted that these students had been working in the Agricultural Chemistry Department through Prof. Weber's cooperation, who was accommodating the pharmacy students as well as his own.

Professor Weber reported at the end of 1886 that he had conducted the following studies for the Ohio Agricultural Experiment Station.

"1. Feedstuff analysis - beets, mangel-wurzel, carrots, corn-fodder, oat hay, oat straw, linseed meal (old and new process), white and yellow corn, oat hulls from the manufacture of oat meal.
2. Analysis of manures and fertilizers.
3. Analysis of drinking water.

4. Microscopic examination of butter and its adulteration (See Proceedings of American Society of Microscopists, 1886).
5. Experiments with soil, devised to determining the wanting ingredients of the soil for farmers throughout the state in order to guide them in purchase of fertilizer.
6. Analysis of muck with directions for making bed fertile.
7. Analysis of cheese, full milk cheese and Chicago flats.
8. Chemical analysis of butter. Of 69 specimens examined 32 were genuine and 37 adulterated. (Report of Ohio Dairy and Food Commission 1886).
9. Vinegars. Of 12 commercial vinegars sold as cider or fruit vinegar, 2 were genuine, 10 fraudulent (Report of Ohio Dairy and Food Commission 1886)."

As manager of the University farm, Professor Weber reported that the sugar beets produced 20 tons per acre and this compared favorably in terms of usable yield to 26 tons of mangel-wurzel (mangold) per acre.

With all these activities of teaching, research, public service and farm management, Professor Weber was a very busy man. In these activities we get some idea of the vigor with which he executed his responsibilities and of the nature of how he visualized the role of chemistry in a university as well as the role chemistry should play in agricultural development and in the public health field.

In the ensuing years Professor Weber was relieved of the management of the University farm. President Scott reports in 1887 that there were 21 students in agricultural chemistry of which 3 were in advanced work and the professor "has contributed a material part to the work of the state experiment station, the food and dairy commission and the city board of health" and notes that the working equipment in chemistry is the best in the university.

For the short course (2 years) in agriculture, a year of agricultural chemistry was required. The regular course required this same sequence in chemistry and in addition a second year's work in agricultural chemistry was recommended. In this, two lectures per week were given to the applications of chemistry to agriculture and three 2-hour laboratory periods per week were devoted to advanced analytical work pertaining to soil, water, fertilizers, manures, feedstuffs, milk, butter, cheese, etc.

During the early 1880's the Bachelor of Agriculture degree had been instituted as distinguished from the standard B.S. program. This B. Ag. program had much more emphasis on veterinary medicine and zoology which were of course at that time largely descriptive disciplines. This move was evidence of a dualistic attitude already present in the young University - the so-called professional or tagged degree as contrasted with the Bachelor of Science, Bachelor Arts, or Bachelor of Philosophy degrees which were considered the mark of an educated man. This narrowing

dichotomy which has plagued many universities, and perhaps even more the Ohio State University, through their histories was noted in President Scott's 18th annual report in 1888. "In what I have said two marked tendencies of the university are manifest, one industrial, the other scholastic, one reaching outward to meet and help the farmer, the mechanic and the miner, the other reaching upward to aid the aspiring student toward the heights of learning. These are the tendencies which, when adequately realized, are to form the university of a new and better type".

In this same report President Scott says that "the laboratory of agricultural chemistry lacks desks for several students" and that "the pharmaceutical laboratory is in the same condition".

In reporting on very favorable response of the University's participation in the Cincinnati "Centennial Exposition" President Scott relates 15 departments had exhibits. The Department of Chemistry had a 95 square feet display showing the apparatus one student would use in qualitative analysis and in quantitative analysis, and the Department of Agricultural Chemistry had the largest display of 308 square feet which "consisted of exhibited analyses of principle feeding stuffs as arranged in bottles of suitable size to show the amount of protein, fat, fiber, nitrogen free extract and ash content in

1. Hay of 10 varieties
2. Straw: as wheat, rye, oat, barley
3. Roots: sugar beets, marigolds, carrots, potatoes
4. Leaves: beets, carrots, etc.
5. Grain: corn, oats, wheat, rye, barley, etc.
6. Manufactured products: bran, cottonseed meal, linseed meal, hominy meal, etc.
7. Varieties of peas and beans
8. A chemical balance and sets of apparatus for students, as well as for analysis of butter, milk, fertilizers, water, etc. were shown".

During the 1887-88 school year the Department of Agricultural Chemistry reports enrollments of 18, 10 and 9 first year students in the autumn, winter and spring quarters respectively and 3, 3, and 2 second year students. The Department of Chemistry lists 97 students in inorganic chemistry (no laboratory), 16 students in analytical and 44 in organic chemistry and notes that the assistant, Mr. Keffer, had a class in stoichemistry. The University roll included 11 graduate students as follows: 3 in history and political science, 3 in science, 2 in mining engineering, and 1 each in botany, physics, and comparative anatomy.

The chemistry building was completely destroyed by fire in 1889. The second floor had been occupied by the Chemistry Department and the first floor by Departments of Mining and Metallurgy, Pharmacy and Agricultural Chemistry. Fortunately the legislature was in session and immedi-

ately appropriated funds for a new building and equipment for these departments. In the interim Agricultural Chemistry moved in with Horticulture and Veterinary Medicine was transferred to the Agricultural Experiment Station Building.

With increasing interest in both degree courses and short courses, enrollments went up. Mr. Lloyd M. Bloomfield was added as an assistant in the department and Professor Weber was no longer listed in the roster of the Ohio Agricultural Experiment Station but was shown as the Ohio Food and Dairy Commission officer at the University with title as Chemist in addition to his responsibility as Professor of Agricultural Chemistry. The 21st Annual Report of the University in 1891 indicates that 125 students were enrolled in Agricultural Chemistry, yet there were only 54 laboratory desks available. This necessitated teaching several sections and made much extra work for Professor Weber who requested more building space.

The great diversity of educational interests and philosophies operative at the University is illustrated by observing the degrees conferred at the annual Commencement in June, 1890:

2 Bachelor of Agriculture
2 Bachelor of Science
2 Civil Engineer
7 Bachelor of Arts
5 Bachelor of Philosophy
3 Mechanical Engineer
4 Doctor of Veterinary Medicine
3 Graduate Pharmacist
1 Master of Arts
2 Master of Science

At the same commencement an honorary Master of Agriculture was conferred on Mr. Charles E. Thorne, former university farm manager, former editor and critic of the University and, at the time, Director of the Ohio Agricultural Experiment Station, and an hororary Ph.D. on William I. Chamberlain, President of Iowa State College, former editor and also a critic of the University who had turned friend and supporter of the University.

1891 was an eventful year for the Department of Agricultural Chemistry. Mention has already been made of Dr. Townshend's retirement. He was indeed a supporter of Agricultural Chemistry. Fortunately his successor was Professor Thomas Forsythe Hunt, an 1884 graduate of the University of Illinois, who served two years as Assistant State Entomologist for that state, six years as Assistant in Agriculture of his alma mater, and a short time as Professor of Agriculture at Pennsylvania State College. Professor Hunt was a dynamic leader but infortunately he stayed at OSU only until 1903 when he became Dean at Cornell.

By far the most unfortunate incident of the year was that the Ohio Agriculture Experiment Station left the University. Many persons of limited vision in the University were happy to see it go. The research and graduate programs in this Department and later in the other newer departments related to agriculture would suffer because little or no financial support for reseach was available from the university budgets in the years to come. The whole university lost because in many young land grant universities the patterns of graduate education and research were established and supported in a large measure by Hatch Act and other experiment station funds. But these resources which stimulated graduate education elsewhere with the formation of graduate schools were sent to the Agricultural Experiment Station in Wooster and not to the Ohio State University. For biochemistry, traditionally a graduate discipline which developed in relation to colleges of agriculture, this move by the station was to prove almost an irreparable loss when we compare ourselves to similar departments in our sister institutions.

The Hysell Act of the same year authorized a 1/20 mill levy for University purposes and permitted the University to borrow against these funds of future years. Although direct state appropriations from the general revenue funds for university operations would not be forthcoming as a policy of the state legislature for almost another decade and a half, the Hysell Act had a direct result on the Department of Agricultural Chemistry for it permitted the planning and building of buildings, one of which was the construction of Townshend Hall in which the Department would be housed from 1898 until 1952.

The fourth major event of 1891 involving the Department was the Henry F. Page bequest. This was the first bequest to the university of any magnitude and came as a great surprise to the Board of Trustees. Mr. Page, an attorney from Circleville, bequeathed, with the concurrence of his wife, almost his entire estate consisting largely of a farm and other property near Circleville and, surprisingly enough, some excellent farmland not far from the University of Illinois, in Champaign County, Illinois. Mr. Page had served with the Hon. T. J. Godfrey in the Ohio Constitutional Convention and they had become friends. Mr. Godfrey, who was appointed to the University Board of Trustees in 1878 and served 25 years, apparently knew nothing of Mr. Page's intentions as no one knew if Mr. Page had ever visited the University. On at least one occasion he asked Professor Weber to visit him in Circleville regarding some matters pertaining to his farm and particularly for Professor Weber to examine and make some tests on his well. Professor Weber had dinner with Mr. Page who had at that time expressed unusual interest in the University. Mr. Page had made many inquiries of Professor Weber about the program of the University and apparently was well pleased with what he had learned. The only direct business Mr. Page had with the University was a request for University Catalog shortly before his death. Thus the service tendered by Professor Weber to a potential friend of the University resulted in a bequest which, after extended litigation to the Supreme Courts of Illinois

and Ohio and the Supreme Court of the United States, yielded $217,000 when the case was finally settled 21 years later in 1912. And so the department through its first professor had an influence in providing Page Hall for the College of Law.

Professor Weber had long had an interest in milk and dairy products because of his work with the state boards of health in both Illinois and Ohio. He found ready support for a dairy program in Professor Thomas F. Hunt, Professor Townshend's successor. Shortly after Professor Hunt arrived on campus he and Professor Weber proposed that the University start a dairy department because efforts in this area had led to considerable farmer interest and to a successful program at Wisconsin. Accordingly on June 13, 1894, the Board of Trustees authorized a dairy laboratory to be installed in the Chemistry Building with a budget of $2250 under the supervision of President Scott and Professors Weber and Hunt. That same year the Ohio House of Representatives had voted $40,000 for a university dairy program but the generous appropriation lost in the Senate. Nevertheless, the course got underway by hiring Mr. Dewitt Goodrich as Assistant Professor of Dairy Husbandry, Oscar Bailey as Assistant in butter making and B. B. Herrick as lecturer in cheese making. Mr. W. C. McCracken lectured on the care of boilers and engines. The new dairy program attracted much favorable interest in the agricultural community and 43 students enrolled in the dairy courses. The College of Agriculture enrollment jumped to 38 students in the 4 year degree course; 34 students in the 2 year course; 8 students in the special dairy program and 3 graduate students. From this beginning the Dairy Technology Department developed. The Department of Agricultural Chemistry added a course in the Chemistry of Milk and Milk Testing to serve the new department. Courses in dairy chemistry and research in the chemistry of milk and milk products were continued in this department for over 60 years and Professors John F. Lyman and E. F. Almy and their students made very significant contributions to the modern dairy industries through their pioneering research which at times was labeled as too theoretical to have any practical value.

In the early years all candidates for degrees - bachelors as well as masters and doctors - had to submit a thesis. As one surveys the titles it is at once apparent that Professor Weber was involved in a number of senior theses. In 1896 of four theses for the Bachelor of Agriculture degree two were biochemically oriented and were done with Professor Weber - "Food Value of Wheat as Determined by Actual Digestion and Feeding Experiments" and "The Action of Certain Antiseptics on the Process of Digestion". In 1908 of the 31 bachelors theses, six were oriented to agricultural chemistry and so the influence of the department was strong in the undergraduate program in the College of Agriculture, and as we shall see also in the graduate program in the university.

Professor Weber's research activities were the first in chemistry at the University and he published much of this work, occasionally giving credit to a bright undergraduate who had assisted him. A list of his publica-

tions in the Journal of American Chemical Society - the first of any OSU faculty - will show the nature of his research interests.

1. "Notes on Certain Reactions for Tyrotoxicon", H.A. Weber, J. Am. Chem. Soc. 12 485 (1890).
2. "On the Occurrence of Tin in Canned Food", H.A. Weber, J. Am. Chem. Soc. 13 200 (1891).
3. "Raphides, The Cause of the Acridity of Certain Plants", H.A. Weber, J. Am. Chem. Soc. 13 215 (1891).
4. "On the Behavior of Antiseptics Towards Salivary Digestion", H.A. Weber, J.Am. Chem. Soc. 14 4 (1892).
5. "On the Determination of Cane Sugar in the Presence of Commercial Sucrose", H.A. Weber and William McPherson, J.Am. Chem. Soc. 17 312 (1895).
6. "On the Action of Acetic Acid and Hydrochloric Acid on Glucose", H.A. Weber and William McPherson, J. Am. Chem. Soc. 17 321 (1895).
7. "The Behavior of Cold Tar Colors Toward the Process of Digestion", H.A. Weber, J. Am. Chem. Soc. 18 1092 (1896).
8. "Root Tubercles in Water Culture", H.A. Weber, J. Am. Chem Soc. 20 9 (1898) "work was entrusted to J.C. Button, one of the writers advanced students."
9. "Light as a Factor in Sugar Production", H.A. Weber, J. Am. Chem. Soc. 21 53 (1899).
10. "Notes on Testing Soils for Application of Commercial Fertilizers", H.A. Weber, J. Am. Chem. Soc. 21 1095 (1899).

The papers by Weber and McPherson were actually taken from the dissertation William McPherson, Jr. submitted for his Doctor of Science degree, the second earned doctorate in chemistry from the Ohio State University - the first being that of Professor Weber himself. McPherson, who was an Assistant in chemistry, had received his master's degree in 1891. The doctoral research obviously reflects Professor Weber's interest in sugar. Dr. McPherson upon receiving his D. Sc., went to the University of Chicago for a Ph.D., which he earned with dispatch and returned to the Ohio State University as Associate Professor of Chemistry in charge of the Department in 1896. At the time of McPherson's and Weber's research Mr. William Lloyd Evans was an Assistant in Ceramics. Shortly after, he joined Professor McPherson in the Chemistry Department and took up the study of the Chemistry of carbohydrates as the major research interest for himself and his students. The chemistry of carbohydrates has had a prominent place in the Chemistry Department ever since. Professor Evans gained world renown as an authority in carbohydrate chemistry. Professor Evans passed on this field to his student, equally eminent Regents Professor Melville L. Wolfrom. Now as Professor Wolfrom approaches retirement Professor Derek Horton is carrying on the tradition. It should be noted also that Professor Evans was equally well known as an outstanding teacher of freshman chemistry who attracted many aspiring scientists to the field while at the same time developing a feeling for chemistry among all of his students by effective lectures and laboratory exercises directed to broad student interests.

The Ohio State University's first Professor of Chemistry was Sydney A. Norton. He was born in Trumbull County, Ohio in 1835 and earned an A. B. degree from Union College and became a tutor at Poughkeepsie Collegiate Academy. Then he became principal of the Hamilton, Ohio, High School in 1858. He was awarded an M. A. by Union in 1859. From 1858-66 he taught high school in Cleveland and then went to Miami Medical College in Cincinnati to teach chemistry until he came to Ohio State in 1873. Miami Medical College awarded Mr. Norton an M. D. in 1869.

A perusal of Professor Norton's examinations in his beginning chemistry course will reveal questions of biochemical and medical interest. Out of 14 questions in the 1876 final examination in the first quarter of his beginning chemistry course the following four have a biological emphasis:

6. (What is) "Composition of the atmosphere and (what are) the uses of each constituent?"
7. (What is the) "Relation of carbonic anhydride to respiration? When dangerous? How to avoid danger?
11. "How may the poisonous products of decay be avoided or removed."
13. "What is osmosis? How does it act in relation to animal life."

All questions in the second quarter were industrially oriented but in the third quarter 3 of 15 were biologically oriented.

8. (What are the) "Kinds of sugar? Sources? Manufacture?"
9. (Describe) "Fermentation: necessary conditions; chemical changes".
15. (What is) "The process of nutrition in animals".

His medical background did manifest itself in pre-medical college work and in pharmacy. He worked with others toward the establishment of a pharmacy program which soon became a part of the new university. He was interested that the University should have a medical school but this was not to be until some decades later because of lack of funds. Professor Norton did some teaching however in the local medical schools which in time were to become a part of the University.

Professor Norton did not offer laboratory work except for the advanced student. His first year college chemistry was always taught without laboratory. When Professor Weber came in 1884 he insisted that agriculture students study chemistry with laboratory from the beginning and so from arrival in 1884 Agricultural Chemistry carried more credit than general freshman chemistry because Professor Weber required laboratory work at least three times per week. Professor Weber used Professor Norton's book for lectures and recitations but used his own text, "A Select Course in Qualitative Analysis" for laboratory. Professor Weber's first year course had essentially two quarters of qualitative and one quarter of quantitative analysis and Professor Norton's students got no laboratory until the second year.

It is inevitable that the essentially German educated Professor of Agricultural Chemistry, strongly oriented to laboratory instruction for the student, and the American educated Professor of Chemistry, as strongly oriented away from laboratory instruction, should attract comparisons. The two professors of chemistry occupied the same building. Almost from the beginning of Professor Weber's tenure he had as many or more laboratory students in chemistry than did the Chemistry Department. The activity by students in Professor Weber's laboratory and the active research program of Professor Weber, who used students as assistants, attracted the attention of students and professors alike.

In 1891 all engineering students were shifted from the courses in the Chemistry Department to the Agricultural Chemistry Department. This additional teaching responsibility was to continue until after reorganization and modernization of the chemistry department several years later. This shift put a great burden on Professor Weber and his assistant Mr. Bloomfield. For example, in the autumn of 1893 there were 121 beginning students in the laboratory for the fall term and 113 second quarter students in the winter.

This heavy teaching responsibility for Department of Agricultural Chemistry continued until Dr. William McPherson returned to the campus from his studies at the University of Chicago in 1896 to become Associate Professor of Chemistry in charge of the Department and Professor Norton was appointed Lecturer with considerably reduced responsibility. He left the university as Professor Emeritus in 1899 and for a time continued teaching at the Starling Medical College in downtown Columbus.

Essentially the teaching program of Professor Norton was unchanged from the beginning of his tenure in 1873. When Professor McPherson took over the department he devoted his time to reorganization and updating the teaching program and by the next school year the course structure in chemistry was modernized with laboratory instruction at all levels and with new young staff interested in research as well as teaching.

The Board of Trustees had considerable difficulty finding a successor to President William H. Scott. Over two years were required and among the many candidates under consideration were two men who were later to serve as President of the United States -- William Howard Taft and Woodrow Wilson. One of the problems was the salary limitations placed on the University by the legislature. In late 1894 Chancellor James Hulme Canfield of the University of Nebraska was offered the post and he became the Ohio State University's fourth president the following June.

President Canfield's concept of a university differed in some ways from many educators of the day. He considered that the university should properly become something of the supreme segment of the entire public school system

of the state. His administration was both liberal in some aspects and classically conservative in others. He was a decisive person and his tenure was a short stormy four years which nevertheless affected the manner in which the university was to grow.

President Canfield was sympathetic to many of the innovations started by Professor of Agriculture Hunt. He supported the Departments of Agriculture and Agricultural Chemistry in starting a Dairy Department. He was anxious to see the university establish Departments of Home Economics, of Education and of Medicine. The first two were started but the faculty opposed medicine because the university had insufficient funds for what it was already trying to do.

In one of his reports to the Board President Canfield lamented that there was not sufficient money to support a teaching faculty and a research faculty as he thought a true university should have, and he commended many of the faculty for doing research on their own time. He was unsympathetic with inbreeding of staff and he was opposed to departments hiring OSU graduates as assistants and permitting them to work for several years toward Masters and Ph. D. degrees. Some felt that President Canfield was not too sympathetic with graduate work and the use of graduate assistants in teaching.

Some years previous to President Canfield's arrival the Board of Trustees had authorized the construction of a Manual Training Building and the establishment of an Industrial Department. Mr. Arthur L. Willston, a young graduate of the Massachusetts Institute of Technology who stayed on there to teach a few years and had had experience as a construction engineer, was retained to initiate the new program. Willston was a zealous hard worker and a very intelligent man. His new program was well planned in detail and he executed his new educational venture with considerable effectiveness; so much so that his work became favorably known outside of the university as unique in the country. Many faculty members were unsympathetic with the "introduction of manual training as it was unbecoming of a university" and the Department of Mechanical Engineering was hostile according to Mr. Alexis Cope, Secretary of the Board of Trustees. Willston's courses were repeatedly turned down by the faculty but he persisted and found a champion in Professor N.W. Lord, Professor of Mining and Metallurgy and later Dean of the College of Engineering. His courses were finally accepted. In addition to directing the work in the foundry, forge, machine and carpentry shops he continued advanced study of mechanical engineering which he immediately applied to his own courses. Willston was a demanding teacher and some unsympathetic faculty prodded their students to complain. Consequently, Professor Willston became the subject of a campaign by innuendo in spite of the fact that he was a personable, calm, neat and tactful person.

President Canfield, the University's new president, soon became involved and sided with Willston's critics with the result that he secretly fired Willston to the dismay of everyone. Immediately eight of the senior and most respected professors in the newly established Colleges of Engineering and Agriculture sent a letter to the Trustees that President Canfield be forced to retract his action. Professor Willston's unusually effective work had gained the admiration of many faculty who did indeed feel that such a program as that of Professor Willston should be a part of the land grant university for the "industrial classes".

Although President Canfield was forced to retract by the Board he continued baiting Professor Willston who refused to knuckle and the feud continued and many members of the faculty became involved. After some months a second attempt to fire him was thwarted by Professor Willston himself, who left the university at more than double his salary as principal of Pratt Institute of Brooklyn, New York. This parochial and limited view by faculty and administration of what a university should be had caused a budding scholar to leave, for Professor Willston was to become an outstanding leader in engineering education. In only a few years he was to serve on a commission to plan the physical facilities and educational program for the new Carnegie Institute in Pittsburgh and, after this, additional important responsibilities and honors were to come his way.

In 1896 President Canfield proposed the reorganization of the University into six separate colleges. This was approved and so were founded:

1. The College of Agriculture
2. The College of Arts, Philosophy and Science
3. The College of Engineering
4. The College of Law
5. The College of Pharmacy
6. The College of Veterinary Medicine

The new organization was in keeping with that of the universities in other states, and, of course, it facilitated the administration in the growing university which was passing its first thousand in enrollment. But there was a very bad feature to the new set up. President Canfield in his reorganization allowed the old dichotomy to rear its ugly head--the College of Arts, Philosophy and Sciences went on a semester system while all other colleges retained the quarter system of courses. The result was that the intercourse between the colleges was severely impaired. Students were penalized in that they could not schedule courses outside their own college and intellectual snobbery was stimulated anew. It became a matter of policy that students of one college could not get credit for courses in other colleges. The College of Arts, Philosophy, and Science embarked on a policy of not permitting its students to take courses in other colleges of the university and then this

position was later modified to approve only certain courses in other colleges. Courses on surveying in the College of Engineering were approved and later almost all courses in electrical engineering but not other areas of engineering or agriculture. Down through the history of the university to the present day, this policy of one college reserving for itself the right to decide what courses were acceptable for an educated man and what were suitable for the lesser areas of "practical" or mission oriented areas has deterred healthy growth.

The so-called thirty hour rule was born. The student could not use more than thirty quarter hours credit for work done in a college in which he was not registered. This rule was rigidly enforced and when the author first came to the Ohio State University in 1940 it was a shock to discover that undergraduate students aspiring to careers in biochemistry were unable to take sufficient foundation courses in chemistry. physics and mathematics if they were registered in the College of Agriculture. Many enrollees in this college did become interested in biochemistry only to find that the way was made difficult, costly, and often almost impossible because foundation courses were barred to them by the 30 hour rule. If the students changed to the Arts College,they would get very little credit for work done and would find themselves attempting a chemistry major in a department whose professors had no interest in biochemistry.

The anti-biochemistry attitude was not unique in the Ohio State University Department of Chemistry. It was a fairly common feeling in departments of chemistry throughout the country in the first half of the twentieth century. Chemistry departments gave more emphasis to industrial aspects of chemistry and to organic and physical chemistry. Consequently the descipline of biochemistry was generally developed in colleges of agriculture and later in colleges of medicine because of an increasing awareness that fundamentally life processes are chemical in nature. Even the auspicious American Chemical Society gave little attention to biochemistry and biochemists during these years, and only recently has it given suitable attention to biochemistry as a major area of chemistry comparable to the traditional areas of inorganic, organic, analytical and physical chemistry.

Thus for the Department of Agricultural Chemistry the new college structure was a second major blow in its formative years--the first being the removal of the Experiment Station--to its development. But in spite of its restriction of only serving students in the College of Agriculture, its work increased notably because enrollments in agriculture increased.

The new college structure did not initially serve the needs of the university in graduate education. Each college had to have its own graduate program, and this tended to lead to diversity in standards and educational philosophy. Some professors and deans were not interested in graduate work, others wanted graduate programs limited to the master's degree and others wanted to embark immediately on Ph. D. programs. This situation

continued until the unifying influence of a university wide Graduate School came into being wherein graduate programs became department or discipline oriented. The Department of Agricultural Chemistry played an important role in the graduate program of the College of Agriculture and a number of master's degrees earned in the College before the establishment of the Graduate School were done under the supervision of professors in the Department of Agricultural Chemistry, and through its history graduate work has been a major part of the total program of the Department.

In 1898 a building for the College of Agriculture was completed. The new Dairy Department and the Department of Agricultural Chemistry, which were both housed in the Chemistry Building, were moved to new and more spacious quarters. Professor Weber's emphasis on laboratory work for his students resulted in large and spacious laboratories for beginning and advanced students and for research. The new building attracted more students to the College of Agriculture and to the Department and so enrollments went up and continued to do so in step with other segments of the University. The next ten years was to see enrollments treble from 1000 to 3000 students.

The space vacated by the Dairy and Agricultural Chemistry Departments in the Chemistry Building permitted rapid expansion of the offerings of the Chemistry Department and provided space for more student laboratories. At the same time the physical separation of the Department of Chemistry from the Department of Agricultural Chemistry tended to impede the stimulating mutual cooperation enjoyed by the two departments up to that time. This, on top of the reorganization of the university placing the two departments in separate colleges, unfortunately accentuated the dichotomy which was to develop in the programs of the two departments.

President William Oxley Thompson of Miami University replaced James Hulme Canfield as President of the University in 1899 and was to serve for 26 years and bring a large measure of stability to the University. President Thompson was a clergyman by training. He had worked as janitor and farm hand to go through Muskingum College and had put Miami University on its feet after its temporary collapse due to economic difficulties. President Thompson tactfully resolved many of the problems of the growing university. He was a polished preacher and speaker and became a forceful spokesman and effective negotiator for the university.

Shortly after he took office the College of Arts, Philosophy and Sciences decided to change back and join other colleges in using the quarter system and thereby become more a part of the whole university again. Even so many of the rules and policies referred to above remained.

The Chemistry Building was destroyed again by fire in 1904. The facilities of the Department of Agricultural Chemistry were put at the disposal of the Chemistry Department and the two departments shared very crowded quarters until another Chemistry Building (the south half of the present Derby Hall) was finished.

Shortly before his leaving the university to go to Cornell, Dean Hunt brought Alfred Vivian from the University of Wisconsin to become Associate Professor of Agricultural Chemistry here. Professor Vivian earned his pharmacy degree, Ph.G., at Wisconsin in 1894 and taught pharmacognosy there for a year. He then joined the Department of Agricultural Chemistry at Wisconsin as an Assistant and became Instructor and Assistant Chemist for the Wisconsin Agricultural Experiment Station from 1897-1902. The addition of Associate Professor Vivian to the Department made it possible to keep up with the increasing number of students and to broaden the program of the Department. Professor Vivian's interests complemented those of Professor Weber and he attracted considerable attention for his early work in the chemistry of soils.

Dean Hunt who also was Professor of Agriculture, went to Cornell in 1903, and was succeeded by Mr. Homer Charles Price as "Professor of Rural Economics and Manager of the University Farm" and Dean of the College of Agriculture and Domestic Science. Soon after this appointment, Dean Price found himself at odds and critical of the governor who had vetoed a special appropriation for agriculture.

In 1905 Dean Price reorganized the College of Agriculture. He abolished the Department of Agriculture and from it made four new departments: Agronomy, Animal Husbandry, Dairying, and Rural Economics. These with the Departments of Domestic Sciences, Botany and Agricultural Chemistry made seven departments. In this reorganization Alfred Vivian was promoted to Professor and made Chairman of Agricultural Chemistry replacing Professor Henry Adam Weber who in 21 years as chairman had contributed so much to the University and to the Department. At the same time Mr. John Franklin Lyman was appointed Assistant in Agricultural Chemistry. Mr. Lyman, a native of rural northeastern Ohio, was a graduate of the University of Massachusetts and would in time give a total of 43 years of service to the Department of Agricultural Chemistry, and for 33 of these years he would guide its destinies as its chairman.

The formative years of the Department were those of Professor Henry Adam Weber. His philosophy of teaching, research and service affected the University much beyond the confines of his own department. His work upheld the best and most liberal concepts of the land grant or industrial university. The pioneering research of his students and himself demonstrated the value of applying the disciplines of chemistry to the solutions of biological problems. He implanted the philosophy of his own beloved Professor Justus von Liebig to the teaching of chemistry at the Ohio State University; this was the phil-

osophy of involving the students in laboratory experimentation so that they might develop a real feeling for chemistry. So great was Professor Weber's influence that one wonders what might have been the position of chemistry and biochemistry had he been the university's first professor of chemistry. It is fair to say that he would have indeed resisted the chemistry-biochemistry dichotomy that later developed to plague the growth of biochemistry on this campus. Nor can he be blamed for the many intercollege prejudices which contributed so many barriers to the growth of biochemistry in the university.

V. TWO DECADES OF GROWTH

The growth of the University, and particularly in the College of Agriculture, coincident with the new administration of President William Oxley Thompson brought new responsibilities and opportunities to the Department of Agricultural Chemistry. The increasing popularity of two new programs in the College-Dairy (Dairy Technology) and Domestic Science (Home Economics) brought more degree students as well as short course students to the campus. The Department of Agricultural Chemistry had to serve these groups. There was an increasing interest in the area of soils from both the physical and chemical points of view. The application of chemistry to the study of soils not only was opening up vast new areas for exploration, but was having very practical results on agricultural production. Then, too, there was increasing emphasis in graduate study and research. The addition of Associate Professor Alfred Vivian to the Department in 1902 had helped Professor Weber meet the increased responsibilities of the Department.

The reversal of the Arts College calender from the semester system back to the quarter system permitted its departments to serve better the needs of the other colleges. This together with the expanded facilities and program of the Department of Chemistry made possible by its new building permitted that department to teach freshman chemistry to all students in the university. The result was that students in Agriculture and Domestic Science could take the regular beginning chemistry course and this would permit the Department of Agricultural Chemistry to drop these courses and put increased emphasis on advanced level courses. Consequently, beginning in 1905-1906 school year a new pattern in the teaching program of the Department was established which would be retained basically for almost the next half century. Professor Weber gave up the Chairmanship to Professor Vivian in 1905 and it was to fall on him to execute the greatly revised and expanded program of the Department.

The main features of the course structure under the new program were:

1. Students in the College of Agriculture and Domestic Science would take freshman chemistry in the Department of Chemistry. This consisted of Chemistry 7, 5 credit hours per quarter for the Autumn and Winter Quarters and Chemistry 12, 4 credit hours in the Spring Quarter. Chemistry 7 was inorganic chemistry and consisted of one lecture, one recitation and six hours of laboratory per week. Chemistry 12 was qualitative analysis and consisted of one lecture and six hours of laboratory per week.

2. Domestic Science students would then take following freshman chemistry, Chemistry 7 and 12, two quarters Domestic Science Chemistry

(Ag. Chem. 14, 5 cr. hr./qt.). This was essentially elementary organic and quantitative analysis taught from the biological point of view and emphasized nutrition and food chemistry.

3. Students in Agriculture would take after freshman chemistry three quarters of general Agricultural Chemistry (Ag. Chem. 13, 5 cr. hr./qt.) which was essentially elementary organic chemistry for two lectures per week and 6-9 hours of laboratory per week in quantitative analysis. Both lecture and laboratory were oriented toward agriculture and included elementary soil and fertilizer chemistry such as is taught now in the Department of Agronomy.

4. A series of advanced courses requiring Agricultural Chemistry 13 or organic chemistry and, particularly, quantitative analysis as prerequisites. These courses covered Industries Related to Agriculture (15), Advanced Agricultural Analysis (17); Food Inspection and Analysis (18); Dairy Chemistry (19); Chemistry of Soils (20); Advanced Household Chemistry (21).

5. Research was given a more formal role in the department as Agricultural Chemistry 22 5-10 credits per quarter.

In the years to come changes would be seen in the relative emphasis given various areas in the advanced courses but the general pattern of service courses, advanced and graduate courses and research would be maintained.

Each college had its own graduate program and graduate students were enrolled in the separate colleges. As graduate enrollments increased this arrangement tended toward the formation of a Graduate School. At first the Graduate School of the University was initiated as a committee or Administrative Board consisting of: Professor George W. Knight, Law Chairman; Dean Joseph V. Denney, College of Arts, English; Professor Samuel C. Derby, Latin; Professor Herbert Osborn, Zoology and Entomology; and Professor William McPherson, Chemistry.

Mr. John Franklin Lyman joined the department as an assistant for the 1905-1906 academic year following which he was to go to Yale to study with the eminent Professor Lafayette B. Mendel until 1909 when he returned to the Department upon earning his Ph.D. degree. During Mr. Lyman's absence Mr. William J. Davis B.S. Ag., served as Assistant.

Of the departments in the College of Agriculture, Agricultural Chemistry emphasized graduate study in the catalog somewhat more than other departments. In those years preceding the formation of the Graduate School several of the master's degrees from the College of Agriculture, M.S. Ag., were degrees from this Department.

In 1909 three M.S. degrees were awarded from the College of Agriculture, 19 master's degrees and two Ph. D.'s from the College of Arts, Philosophy and Science and three master's degrees from the College of Education. Two of the three master's degrees from the College of Agriculture were to Reginald Clifton Collison and Stanley Edgar Collison who submitted a joint thesis on "A Study of the Moist Combustion Methods for the Determination of Nitrogen".

In 1910, four M.S. degrees were awarded from the College of Agriculture (23 from Arts, 4 from Education) and one of the four was to Firman Edward Bear who was to join the department for a number of years and who would distinguish himself by becoming a soil scientist of truly international renown. His thesis was "A Study of Available Phosphorus".

Twenty seven M.S. Degrees were awarded in 1911 as follows: one each from Agriculture, Domestic Science, and Engineering, 3 from Education and 21 from Arts, Philosophy and Science. Juntoku Yagi submitted a thesis on "The Theory and Practice of the Manufacture or Condensed Milk". These were the last graduate degrees given by the undergraduate colleges. This was because the Graduate School serving all departments of the University was formally organized with Professor William McPherson of the Chemistry Department as Dean. Professor Alfred Vivian, Chairman of Agricultural Chemistry, was on the first Council of the Graduate School.

A perusal of the course offerings and thesis titles of this period will reveal a considerable interest in the chemistry of soils, and of foods including milk. Professors Vivian and Weber both carried responsibilities for course work and research in the two areas. In 1908-1909 the Department's interest in the chemistry of foods and milk was broadened to include a new three quarter course carrying 3 or 5 hours credit entitled "Chemistry of Animal Nutrition" taught by Professor Vivian. This course became a key course for advanced undergraduates and graduates not only in biochemistry but for all other departments of the university having interest in human or animal nutrition. The importance of this course to the total biochemistry program in subsequent decades is immediately apparent when it is realized that modern biochemistry historically developed from basic nutrition - identifying the essential nutrients and determining their biological functions through an understanding of their metabolic roles. On Dr. John F. Lyman's return from Yale in 1909 it is understandable that the nutrition course should become his responsibility in view of his doctorate under Mendel's tutelage. So Professor Vivian gave more of his attention to soil chemistry and nutrition became the responsibility of Associate Professor Lyman. Professor Weber whose career was coming to a close continued his interest in foods, dairy and soils in his teaching.

The university was shaken up considerably by an adverse appraisal of

the three state supported universities to Governor Judson Harman by Henry S. Pritchett, President of the Carnegie Foundation for the Advancement of Teaching. He said in part. "It is quite evident that the three state universities are not all real universities. The designation might fairly be conceded to the Ohio State University, and if relieved from the pressure of state competition, it would no doubt assume within a reasonable time the efficient and orderly development of such an institution like the University of Wisconsin. The Ohio University is a mixture of college, normal school and academy while Miami University is a fairly good college with the same mixture of normal school and academy". With this the Ohio State University and other state schools were denied admission to the Carnegie retirement program for faculty. The depressing effect on faculty morale was immediate but this appraisal by such a respected group did much to spur self examination within the university and to focus once again attention on the state's lack of effective support for their universities. Thus the rivalries and animosities engendered by the birth and early growth of the university still had quite a depressing influence on popular and legislative support for the university.

The salary role of the department for year closing in 1909 vividly illustrates the severity of the problem.

Alfred Vivian, Chairman and Professor	$2500/yr.
Henry A. Weber, Professor	$2250/yr.
(In 25 years, Professor Weber had not received a salary increase.)	
Firman E. Bear, Instructor	$600
R.C. Collison, Assistant	$600
S.E. Collison, Fellow	$300

Professor Vivian was given additional duties as Secretary of the College of Agriculture and was given a raise of $250 a year the next year. Associate Professor Lyman's salary was $1500 his first year after receiving his Ph.D.

In 1909 the Agricultural Extension Service was created by the legislature and in 1910 additional appropriations were made for this new responsibility of the University. The Department's work in soil chemistry was thus stimulated. Following completion of his M.S., Firman Bear was made Assistant Professor. Also the department was soon to develop an extension program in soil chemistry and fertilizers throughout the state. Orville M. Johnson became an Assistant Professor of Agricultural Chemistry through the Extension Service.

The career of Professor Weber ended by his death on June 14, 1912. Not only did his passing bring to an end years of influential service to the University in shaping the patterns of growth of teaching and research programs in chemistry and agricultural chemistry (biochemistry) but an

end to an era of his Department. The Department of Agricultural Chemistry was now on a new threshhold of growth in its undergraduate and extension teaching and service, in its graduate program, and in its research efforts. The program of the department was to emphasize nutrition; dairy and food chemistry; soil chemistry; and plant biochemistry. These areas were all of interest to Professor Weber and were those areas emphasized in similar departments in other major universities. For many years the ashes of Professor Weber were behind a plaque in Townshend Hall which read:

In Memoriam

HENRY ADAM WEBER
1845 - 1912

Eminent scientist, distinguished public servant, gentleman, scholar, hospitable friend, beloved by his students, esteemed by his associates, honored by the State, pioneer in agricultural chemistry, and one of the foremost in pure food legislation and control.

In grateful remembrance and loving appreciation of his services to this University and to the cause of agriculture, his students have presented this tablet.

The Graduate School formally awarded all graduate degrees beginning in 1912. With the new organization of graduate study all graduate students were classified as to major and minor fields of specialization. In this first list of students registered in the Graduate School four graduate students were identified as majoring in Agricultural Chemistry as follows:

Leland E. Call, B.S. (Agr.), Manhattan, Kansas.
Mabel Miskimen, B.S. (Dom. Sci.), Newcomerstown, Ohio
Walter E. Duth, B.S. (Agr.), Sandusky, Ohio
Clara Smith, B.S. (Dom. Sci) West Unity, Ohio.

The Department of Chemistry at the same time listed 17 graduate students, two of whom minored in Agricultural Chemistry. The next year we find five graduate students in Agricultural Chemistry:

Clinton B. Clevenger, B.S. Agr.; Earl James, B.S. Agr.; Orville M. Kile, B.S. Agr.; Thomas G. Phillips, B.S. Agr.; and Ross A. Thuma, B.Sc. (Otterbein University). Most of these took their minors in Chemistry or Agronomy while two agronomy students and four (of 20) chemistry students minored in Agricultural Chemistry.

The staff of the Department took a sudden spurt of growth and the Catalog for 1912-13 and Announcements for 1913-14 show the following:

Alfred Vivian, Ph.G., Professor and Chairman and Secretary of the College of Agriculture.
John F. Lyman, Ph.D. Associate Professor
Firman E. Bear, M.Sc. (Agr.) Assistant Professor
Thomas G. Phillips, B.Sc. (Agr.), Instructor
Myron A. Bachtell, B.Sc. (Agr.), Instructor, Extension
W.J. Hendricks, B.Sc. (Agr.), Assistant, Extension
Porter Elliott, B.Sc. (Agr.), Assistant, Extension
Earl Jones, B.Sc. (Agr.), Fellow
Clinton E. Clevenger, B.Sc. (Agr.), Fellow
Ernest Basil Hawes, Ph.G., Starling Ohio Medical College, Assistant.

In addition to expanded work in soils and in extension, the department also assisted in teaching chemistry to short course (2 yr.) students by adding the following courses to the total offerings of the Department: "Applications of Chemistry to Agriculture" 4 credit hours for two semesters (Ag. Chem. 51-52) and "Chemistry of Plants", 4 credit hours one semester (Ag. Chem. 53) with Ag. Chem. 51 and 52 as prerequisites. The latter course became popular for degree students and plant biochemistry became a major part of the departments program. At this time also a new course, "Chemistry of Insecticides and Fungicides" 2 credit hours, one semester, (Ag. Chem. 113) was added for regular degree students.

Under Dean Price the College of Agriculture had not progressed as the President and Board of Trustees had wished and in 1915 he was asked to vacate the Deanship and devote his time to teaching Rural Economics. Dean Price preferred to leave the University entirely. He was succeeded as Dean by Professor Alfred Vivian, Professor and Chairman of the Department of Agricultural Chemistry. Professor Vivian had served as College Secretary since 1908 and was active on a number of campus committees and boards and he assumed his duties as dean with a minimum of confusion such as is often associated with a change of deans. In his place Associate Professor John Franklin Lyman was promoted to Professor and Chairman of the Department of Agricultural Chemistry. Dean Vivian gave distinguished service to the College of Agriculture and to the University until his retirement as Dean Emeritus in 1932. Professor Lyman was to serve as chairman until 1948 and to become Professor Emeritus in 1952 - a record of service and leadership unexcelled in the department's history.

Dean Vivian was an aggressive and hard working administrator who at times could irritate others by his straight talk sometimes decribed as lacking tact. It is perhaps fair to say that his liberal views on higher education were rejected by some of his more conservative colleagues. He was aware that, even then, The Ohio State University was not competitive with other universities. The educational philosophies which were guiding

similar institutions in other states were less evident in Ohio and he and many of the faculty were smarting under the adverse report of the Carnegie Foundation to the Governor that Ohio really had no true universities as in other states and that of the state supported schools only The Ohio State University had the barest foundations of a university.

To meet the challenge Dean Vivian tackled two very difficult problems, both of which were of considerable importance to the Department of Agricultural Chemistry - graduate education and research and the dichotomy of the university itself.

Following the Carnegie report the university went through a period of restructuring. Some changes were effected which tended to bring the several sectors of the university together. The Graduate School was formed which at the graduate level at least seemed to put departments on an equal level because the undergraduate college structure was superceded. A department in the College of Agriculture, a department in the College of Engineering etc. could through the Graduate School have programs to leading to the same advanced degrees as departments in the College of Arts, Philosophy and Science. Another unifying influence was the reorganization of courses to put the university on a semester basis. But the College of Arts, Philosophy and Science still insisted on tagged special degrees for other colleges and would not allow credit for many courses in other colleges. They listed "acceptable courses" given by other colleges of the University in somewhat the same manner that the early University bulletins listed by name acceptable high schools in the state whose graduates would be admitted to the University without examination or limitation whereas graduates of the rest of Ohio schools were less qualified, would be admitted only on examination. Other colleges of the University adopted the 20 hour (or 30 quarter hour) rule which allowed credit for only 20 semester hours taken in other colleges. The parochialism of the undergraduate colleges remained.

Dean Vivian worked with only very limited success toward breaking down these attitudes. Within and outside the University he advocated a "new approach" to this problem afflicting not only The Ohio State University but other institutions though perhaps to a lesser degree. His program was the dual degree approach and he spoke to national, state and local groups concerning new cooperative curricula between the College of Agriculture and the College of Arts, Philosophy, and Science at OSU and at other liberal arts colleges throughout the state. Graduates would get both degrees, B.S. in Agriculture, and a B.S. or B.A. from the other college in question. Invariably the combined programs required 5 or 6 years and there were relatively few students who elected such curricula. University records show a few in the University and a few with a B.S. in Agriculture from OSU and B.S.'s or B.A.'s from other colleges in the state.

This double bachelor's degree venture met with only limited acceptance in part because students soon discovered that if their interest turned

to agriculture that with the same expenditure of time they could get an M.S. following the B.S. in Agriculture, or the same M.S. from the Graduate School through a department in the College of Agriculture if they had an A.B. or B.S. from any other accredited college. Thus Dean Vivian's program did not break down the prejudice between the College of Agriculture and the College of Arts, Philosophy, and Science but it did bring the programs in agriculture to other schools and attracted a number of students to the graduate programs in the College of Agriculture including Agricultural Chemistry.

Among some of the early changes within the College of Agriculture which took place in the administration of Dean Vivian was the shift of the soils work out of the Department of Agronomy to the Department of Agricultural Chemistry. This move made the Agronomy Department essentially a department of crops and emphasized the rapidly growing field of soil chemistry and fertilizer chemistry. The importance of soil science was further noted by changing the name of the Department of Agricultural Chemistry to the Department of Agricultural Chemistry and Soils in 1916. Shortly thereafter Firman E. Bear, formerly Assistant Professor who had taken leave of the University to earn a Ph.D. at the University of Wisconsin, returned to the department as Professor of Agricultural Chemistry and Soils. Professor Bear essentially assumed responsibility for the soils work in the department while Professor Lyman, Chairman of the Department, focused more of his attention to the nutritional, food and more basic biochemistry programs of the growing department. The rapidly increasing importance of the Agricultural Extension Service in the total University program stimulated growth of the department both in depth and breadth.

That graduate work was well underway in the department at the inception of the Graduate School is seen in the number of master's degrees earned in the department. During the Graduate School's first year three M.S.'s in Agricultural Chemistry were awarded in 1912. Four were earned in the department in 1913, and five in each year 1914, 1915, and 1916. The effect of World War I is seen in that in 1917 only two were awarded, three in 1918, none in 1919 and only one in 1920. Many of these earning the M.S. in Agricultural Chemistry became distinguished scientists in government, industry, and universities.

Others took up careers as teachers, extension workers, or scientifically oriented professions of various types. Some earned Ph.D.'s here and in other universities.

The first Ph.D. in the modern era was awarded to Josiah Simpson Hughes, a graduate of Ohio Wesleyan University, and a student of Professor John F. Lyman. Dr. Hughes maintained an interest in this department and often visited it. He became head of the biochemistry and nutrition department of Kansas State University and distinguished himself as a pioneering nutritionist, who gave many years of devoted service to Kansas while at

the same taking an active interest in professional and scientific organizations.

Some undergraduate students of the College of Agriculture were of course attracted to the work in soil chemistry and nutrition of the department as these were the so-called glamour areas of the period. A number later took up graduate work. One such was Arthur H. Smith who, after his B.S. (Agr.), studied biochemistry with Professor Lyman and did a rather prophetic master's thesis on "The Synthesis of Urea by Urease". Professor Lyman then sent him to study with Mendel at Yale where he stayed after earning his Ph.D. and became Professor of Physiological Chemistry in Mendel's department. Yale Medical School elected to deemphasize nutrition and biochemistry after Mendel's death and Professor Smith went to Wayne University (now Wayne State University) in Detroit where he continued his outstanding career as scientist, teacher and adminstrator. Besides his role as Chairman of the Department, he served for a time as Dean of the Medical School at Wayne.

Professors Hughes and Smith were among the first of a continuing group of graduate students of Professor Lyman who not only attracted students and led them into scientific careers of very high professional order but often inspired them through his warm and generous personality to the level of reverent affection. Professor Lyman was to advise a large group of Ph.D. students - almost a fourth of all those earned in this department as the first century of the University comes to a close.

Whereas Hughes' doctoral dissertation was on the "Nutritive Value of Corn" the soya bean was beginning to attract much attention in the U.S.A. and the second Ph.D., was awarded in 1919 to William Gray Bowers who submitted a dissertation entitled "The Soya Bean as Human Food." Only now, fifty years later, do we see soya becoming an important source of protein in our food supply in the U.S.A.

(Authors Note: It is of course impossible in a small volume to describe in detail the research programs and the contributions of all graduates of the department. Readers are referred to the appendix where all persons receiving master's and doctor's degrees are listed with dates and thesis titles. Perusal of the list will, however, show the evolution of the research interests of students and professors through Departments history.).

In this period areas of specialization in the department were officially listed in the University catolog as the chemistry of animal nutrition; chemistry of dairy products; chemistry of soils; chemistry of fertilizers; chemistry of plant life, and food inspection and analysis.

It is a great credit to the faculty of the department in these years that they were able to attract so many undergraduates and graduate students

because of numerous university restrictions. The most severe of these was the intercollege barrier that students in one college could get credit for only 20 semester hours (30 quarter hours) credit for work taken in another college. Thus the necessary chemistry, physics and mathematics to support graduate work in biochemistry (Agricultural Chemistry) were in a large part excluded from students in the College of Agriculture. Conversely students in the College of Arts, Philosophy and Science were essentially barred from courses in Agricultural Chemistry or in courses with a biological orientation in the College of Agriculture. This barrier plagued the Department for decades to come and it is hardly a credit to the liberalism of the university that its academic councils and academic administrators refused to affect a solution to this problem.

Professors Lyman and Bear did officially, as best they could, advise students of this artificial barrier resulting from the dichotomy of the University's operational educational philosophy which could materially affect the students program of courses for the bachelors degree. For many years the catalog of the University carried the following or a similar note at the beginning of the listing of the department's course offerings:

"All students intending to major in this department should consult Mr. Lyman or Mr. Bear for advice in outlining a curriculum. It is desirable that this consultation be held soon after admission to the College in order that the student may take best advantage of optional and elective privileges" (Catolog, 1917-18 - Announcements, 1918-19, p. 162).

Already on page 156 the student had been warned. "A student may not elect more than 5 hours per semester in other colleges during junior and senior years."

Not only was the Department of Agricultural Chemistry and Soils increasingly concerned about the undergraduate preparation of their graduate students but this was also the case in other departments. The Department of Chemistry in their announcements during these years noted. "As a prerequisite for admission to graduate work in chemistry all students must have a thorough preparation in general inorganic chemistry, qualitative and quantitative analysis and an introductory course in organic". These were the same requirements of graduate work in the Department of Agricultural Chemistry which noted that at least two years of chemistry were required including acceptable courses in qualitative analysis, quantitative analysis and organic chemistry.

The Department of Chemistry had no program in biochemistry and prior to World War I a number of graduate students in chemistry minored in Agricultural Chemistry. The war itself awakened the United States to the deficiency of their chemical industries and after the war the glamour fields were organic, chemistry, physical chemistry and analytical chemistry

and chemical engineering and relatively few students of the Chemistry Department studied any biochemistry either in the College of Agriculture or the College of Medicine.

The College of Medicine came into being in 1914 but their curriculum was not at all basic science oriented. Medical students were given a four semester - hour course in biochemistry by the Physiology department. Not until the middle 1920's did advanced work in biochemistry begin in the College of Medicine in the Department of Physiological Chemistry, Pharmacology and Materia Medica.

The teaching, research, and extension programs of the Department of Agricultural Chemistry and Soils were well established and the faculty list of the 1918-19 catalog showed:

Alfred Vivian, Ph.G. Dean of the College of Agriculture and Professor.
John F. Lyman, Ph.D. Professor and Chairman
Firman E. Bear, Ph.D. Professor
Edward Riley Allen, Ph.D. Professor (Non-resident, Ohio Agricultural Experiment Station)
Thomas G. Phillips, Ph.D. Assistant Professor
George M. McClure, M.S. Instructor
Guy W. Conrey, A.B. Instructor
Albert Clinton Workman, A.M. Instructor
Henry Bernhardt Froning, M.A. Instructor
Dennis E. Haley, M.S., Instructor
True G. Watson, M.S., Instructor

By 1920 the effect of World War I on graduate enrollment was almost over and the list of graduate students shows the following majors in Agricultural Chemistry out of a total of 208 students in the Graduate School:

Emory Frederick Almy, B.S., University of Nebraska
Sidney William Bliss, B.S., Agr.
Oscar Fisher Boyd, B.A., B.S. Agr.
Richard Bradfield, A.B. Otterbein
Rachel Hartman Edgar, B.S. in Home Ec.
Carl Paul Hinkle, B.S., Muskingum
Samuel Frank Hinkle, B.S. Agr., B.S. Muskingum
Ernest Blaine Wells, B.S. Agr.

The same list shows that Robin Charles Burrell, B.S. Mt. Union, was a graduate student in the Department of Chemistry. Mr. Burrell earned his M.S. and went briefly to the University of Richmond (Va.) and was to return to the Ohio State University in Agricultural Chemistry. He and Mr. Almy were to devote their entire professional lives to the Department of Agricultural Chemistry (Agricultural Biochemistry).

Beside formal courses, graduate students and research the Department of Agricultural Chemistry and Soils also had at this time a large program of soil testing and extension work. As the soils work increased it seemed appropriate that the soils work should be a separate department. Accordingly the soils group was separated from the department and eventfully was joined to the Agronomy Department. So in 1923 the department reverted to its original name of Department of Agricultural Chemistry emphasizing in its program animal biochemistry, plant biochemistry, nutrition, dairy and food chemistry.

The reorganization of the Department was coincident with the return of the entire university to the quarter system with complete restructuring of courses and a new course numbering system that would be retained over forty years. The enrollment at this juncture in the university's history might be of interest

Graduate	382	Engineering	1524
Agriculture	1123	Homeopathic Medicine	50
Arts, Philosophy and Sciences	2972	Law	228
Commerce	530	Medicine	229
Dentistry	181	Pharmacy	209
Education	745	Veterinary Medicine	86
		Applied Optics	40

The total student enrollment reached 10,000, a mere 25% of our present 1969 enrollment, the first year of the new-organization structure. 1923 was indeed a milestone for the university as well as for the Department.

VI. THE ERA OF LYMAN, ALMY AND BURRELL

When the soils program was separated from the department and it reverted to the Department of Agricultural Chemistry, Professor John F. Lyman had already been chairman for eight years. The change reemphasized the essential biochemical nature of the department's program. Professor Lyman, together with two young faculty members Emory F. Almy and Robin C. Burrell, were to become primarily responsible for almost all of the activities of the department for the next quarter century. Thus this period is truly the era of Lyman, Almy and Burrell. They were of different but complementary temperaments and their individual scientific interests gave balance to the small department. They were devoted to their students, their colleagues and their university, and this loyalty is the most characteristic factor which maintained the quality of teaching and research and the growth through periods of initial prosperity, years of economic hardship and war.

The confusion of the change of the University calendar from the semester to the quarter system and attendant organizational alterations were surmounted as the presidency of William Oxley Thompson ended after 26 years with his retirement in 1925. During his tenure he had done much to develop for Ohio a state university of some stature. He had been a unifying influence for divergent interests and developed a sense of purpose for both faculty and students. He was succeeded by Professor George W. Rightmire of the College of Law as the University's sixth President. President Rightmire was to serve until 1938.

In the reorganization of 1923, Thomas Guthrie Phillips was promoted to Professor of Agricultural Chemistry. He had given excellent service to the department since receiving his B.S. Agr., in 1912. He had earned an M.S. from the department in 1913 and a Ph.D. from Chicago in 1917. In 1925 he elected to go to the University of New Hampshire as department chairman where he remained until his retirement, all the time still maintaining interest in the affairs of his alma mater.

Emory F. Almy, B.S. 1916, M.S. 1917, University of Nebraska, joined the department as Assistant in 1919 following service as a chemist in World War I and was promoted to Instructor in 1921 and to Assistant Professor in 1925. Robin C. Burrell, B.S. Mt. Union 1918, M.A. The Ohio State University 1921, joined the Department of Agricultural Chemistry as an Instructor in 1923 after serving two years as Assistant Professor of Chemistry at the University of Richmond (Va.) and was made Assistant Professor in 1925. Both earned Ph.D.'s in the Department and were promoted to Associate Professor in 1933 and to Professor in 1940.

The reorganization and the change back from the semester to the quarter system necessitated restructuring all course offerings in the Department.

However, there was no change in the educational philosophy effecting the students. The intercollege barriers still remained, particularly the so-called 30 hour rule preventing students registered in one college from taking courses in another. This was to remain for many years in spite of the fact that the five undergraduate colleges usually had both basic and applied departments and such arrangements should have tended to promote intercourse between colleges and liberalize educational philosophy in keeping with the original intent and spirit of the Land Grant University. For example, the College of Agriculture had in addition to the more applied departments such as Animal Husbandry, Horticulture, Agronomy and Dairy Technology the Departments of Zoology and Entomology, Botany, and Agricultural Chemistry; the College of Commerce had the Departments of Economics and Sociology; the College of Education had Departments of Pyschology, Music and Fine Arts. The College of Engineering included the Departments of Chemistry, Physics and Mathematics. The College of Liberal Arts included mostly the humanties. The first big move to separate the so-called basic from applied areas come in 1930. When the College of Liberal Arts was renamed the College of Arts and Sciences and the Departments of Chemistry, Physics, and Mathematics from the College of Engineering and the Department of Bacteriology from the College of Medicine were transferred to the College of Arts and Sciences. (The complete change to "applied" colleges and "basic" colleges would be completed in the 1966-1967 general reorganization of the University.) With this arrangement of teaching departments, the 30 hour rule presented many problems and this was particularly true for the undergraduate student having any interest in the area we know as biochemistry today.

The University Catalog for 1921-22 and the Announcements for 1922-23 shows the new course structure in the Department for both undergraduate and graduates together with a prominant note of advice to students interested in major work in the Department.

"Agricultural Chemistry

Professor Lyman, Assistant Professor Phillips, Miss Edgar, Mr. Almy and Assistants

Students expecting to major in Agricultural Chemistry are requested to interview Professor Lyman concerning election of courses in this and related departments.

For Undergraduates

401 General Agricultural Chemistry. Five credit hours. One quarter. Three recitations and two three-hour laboratory periods. Prerequisite: Chemistry 402 or 412. Mr. Almy.

402 Household Chemistry. Five credit hours. Three lectures and two three-hour laboratory periods. Home Economics, second year. Science Nursing, second year. Prerequisite: Chemistry 402 or 412.

403 Household Chemistry. Five credit hours. Three lectures and two three-hour laboratory periods. Home Economics, second year. Science Nursing, second year. Prerequisite: Agricultural Chemistry 402. Mr. Lyman.

For Advanced undergraduates and graduates,

601 General Biological Chemistry. Five credit hours. Three lectures and two three-hour laboratory periods. Prerequisite: Agricultural Chemistry 401 or equivalent; junior standing.

602 Food Inspection and Analysis. Five credit hours. One lecture and four three-hour laboratory periods. Prerequisite: Agricultural Chemistry 401 or equivalent in organic chemistry and quantitative analysis. Mr. Almy.

603 Food Inspection and Analysis. Five credit hours. Four three-hour laboratory periods. Prerequisite: Agricultural Chemistry 602.

604 Dairy Chemistry. Five credit hours. One lecture and four three-hour laboratory periods. Prerequisite: Agricultural Chemistry 401; junior standing.

605 Dairy Chemistry. Five credit hours. One lecture and four three-hour laboratory periods. Prerequisite: Agricultural Chemistry 401, and 604 suggested.

606 Advanced Dairy Chemistry. Five credit hours. One lecture and four three-hour laboratory periods. Prerequisite: Agricultural Chemistry 605.

607 Chemistry of Nutrition. Five credit hours. Two lectures and three three-hour laboratory periods. Prerequisite: Agricultural Chemistry 601 or 403 and Physiology 403, 404.

608 Animal Nutrition. Five credit hours. Two lectures and three three-hour laboratory periods. Prerequisite: Agricultural Chemistry 601 and Animal Husbandry 402.

For graduates

Prerequisite: At least six quarters of work in chemistry is required as a prerequisite to graduate work in Agricultural Chemistry. This work must include acceptable course in general inorganic, organic and quantitative analysis.

801 Plant Chemistry. Five credit hours. Lectures and laboratory arranged Prerequisite: Agricultural Chemistry 601 and consent of instructor.

802 Special Problems. Five-fifteen credit hours.

804 Seminary. One credit hour."

This is quite a teaching assignment for a staff of four (and later three) and represents considerable effort in service teaching for students in other areas. Yet this is the basic pattern of courses maintained by Professors Lyman, Almy and Burrell for almost twenty-five years while at the same time they developed an effective graduate program.

All students in the College of Agriculture were required to take Agricultural Chemistry 401. The lectures were essentially organic chemistry with emphasis on biologically important compounds and the laboratory was elementary quantitative analysis with the same emphasis. Two quarters of general chemistry were required as prerequisite. During Professor Almy's entire career he taught this course or those which later evolved from it and upon his retirement after almost 40 years of service more that 85% of all College of Agriculture students had been in his classes.

402 was similar to 401 except with a slight shift of emphasis to the interests of home economics and nursing students. These students usually took still another quarter of chemistry in the form of 403 to make a total of four quarters of chemistry.

Dairy technology was a very popular area in these days and the Department of Agricultural Chemistry served these students. Many graduate students studied with Professors Lyman and Almy and earned advanced degrees under their direction. The cooperation of Professors Lyman, Almy and Robert Stoltz, of Dairy Technology was very close and resulted in quite significant research of great importance both to the science of nutrition and to the dairy industry itself. Course 602, 603, 604, 605 and 606 became also Professor Almy's responsibility and these courses were effectively taught by him for many years.

The key course for the advanced undergraduate or major in the department was 601, General Biological Chemistry. This course was the responsibility of Professor Burrell who taught it for most of his career. Professor Lyman turned his attention to 607, Chemistry of Nutrition, a general basic nutrition course and to 608, Animal Nutrition, for those students interested in nutrition in animal and poultry production. The science of biochemistry was developing around the identification of essential nutrients so 601 and 607 were indeed the foundation course for graduate study.

Plant Chemistry 801 was initially the responsibility of Professor Phillips and when he left, he was replaced by Professor Burrell who taught the course for many years. He used the course for graduate students not only in biochemistry but in botany, plant physiology and horticulture. This was the foundation course for degree students in plant biochemistry.

General biochemistry, nutrition, food and dairy chemistry and plant biochemistry were the areas available for graduate study and research in the Department in the early twenties. The Department of Chemistry had no biochemistry but some early bulletins showed some biological considerations in the third quarter of physical chemistry. Although the medical and dental curricula had some physiological chemistry, the College of Medicine in its early years gave little emphasis to advanced study in the basic sciences related to medicine. The physiological chemistry courses in Medicine and Dentistry were taught in the Department of Physiological Chemistry, Pharmacology and Materia Medica. Professor Clayton Smith was in charge at this time. Shortly after the reorganization of the university in 1922-1923, two professors were to join Professor Smith and serve the university until their retirement. There were Dr. Helen L. Wikoff, a student of Professor Cecil Board of the Department of Chemistry and Dr. John Bernis Brown, who received his Ph.D. from the University of Illinois in 1921 and who served two years in research in pharmacology at the University of Pennsylvania and two years as a reasearch chemist at Swift and Company before coming to the Ohio State University. Dr. Brown was made Associate Professor in 1930, Professor in 1941, and succeeded Professor Smith as Chairman in 1957. Professor Brown retired in 1964 and Professor Wikoff in 1969.

From the middle 1920's, the University had two biochemistry programs - one in the College of Medicine and another in the College of Agriculture and three departments teaching chemistry - the two biochemistry groups and the Department of Chemistry in the College of Engineering. Then, too, at about this time the division of Industrial Chemistry split off from the Department of Chemistry and became the Department of Chemical Engineering. There was considerable personal cooperation among certain professors of all of these groups in subsequent years, yet it must be said that intercollege and, at times interdepartmental rivairies tended through the years to undermine healthy and rapid growth in biochemistry in a manner comparable to some other universities. It is indeed tragic that at this level of university bureaucracy, cooperation, understanding and meaningful negotiation have been wanting and not a small part of this difficulty rests in the old academic dichotomy of the University as a whole - what is and what is not acceptable for a "truly educated man".

Notwithstanding the intramural difficulties, the 1920's saw much growth in the Department of Agricultural Chemistry. 19 students earned M.S. degrees and 13 earned Ph.D. degrees in the ten-year period 1921-30.

Nutrition was becoming the glamour area of biochemistry and would remain so until all the nutrients had been identified shortly after the close of World War II when the metabolic functions of the nutrients were to be elucidated. The idea that certain chemical compounds were necessary in minute amounts attracted attention to this new (old) area of science. The economics of animal production also stimulated basic nutrition research just as crop production stimulated research into the chemistry, physics and microbiology of soils. World War I stimulated interest in other branches of chemistry and a rapid expansion of the

chemical industry offered many opportunities for the graduate chemist-sometimes in spite of the economic collapse of the 30's. It might be of interest to observe the breakdown of graduate students in chemistry for a number of years at The Ohio State University.

Year	Agricultural Chemistry	Department of Physiological Chemistry, Pharmacology and Materia Medica	Chemistry*	Chemical Engineering
1922	8	0	74	
1923	12	2	95	
1924	16	0	89	
1925	15	0	104	
1926	21	0	102	
1927	14	3	108	
1928	12	2	109	
1929	11	4	129	
1930	13	2	151	
1931	15	25	170	
1932	15	12	148	37
1933	18	16	139	35
1934	13	14	121	26
1935	11	11	114	20
1936	9	12	118	24
1937	11	7	133	39
1938	11	13	180	46
1939	17	14	171	51
1940	11	17	192	36
1941	16	13	184	39
1942	13	18	152	30
1943	11	8	138	25
1944	7	10	115	21
1945	3	5	68	15

* From 1922-31 inc. data for Chemistry includes Chemical Engineering.

In the period of the 1920's and 1930's a number of graduate students in the Department were only part time students who worked or taught at OSU or other colleges in the state. Less than half were graduates of the Colleges of Agriculture here or elsewhere. It has already been noted that it was difficult for students registered in the College of Agriculture to take sufficient courses in chemistry, mathematics, physics and biology to support graduate study. Consequently there was no curriculum offered in the College to meet this need. (Actually a curriculum of this kind was not to be allowed until 1955).

However some curricula in the college such as Animal Science or Plant Science did, with careful selection of courses, offer some opportunity for the Department of Agricultural Chemistry to have a few majors. So it is understandable that the emphasis was on service courses for students in agriculture, veterinary medicine, home economics etc. and on graduate programs which of course meant research. In spite of all too limited resources - money, facilities and space - Professors Lyman, Almy and Burrell and their students carried on imaginative research programs.

Professor Lyman's interest in nutrition and in dairy chemistry led to significant basic research. This work was not only of academic interest but of industrial importance though in the late 20's some of it was not widely recognized to be so. In much of this work his student and colleague for many years Professor Emory F. Almy was involved.

It had long been recognized that normal cow's milk forms a hard curd which many human infants have difficulty digesting. Heat sterilized canned evaporated milk stabilized with sodium citrate or phosphate was tolerated to a greater extent by many babies because of the softer curd formed in the stomach. In studying the phenomenon of milk coagulation during gastric digestion it was considered that if the coagulation process could be modified to make the curd softer and more digestible like the curd of mother's milk, then cow's milk could be more useful as a substitute for mother's milk. Milk contains ionized and non-ionized calcium and the hard curd resulted from the ionized calcium reacting with the casein during the coagulation process. In essence this is the fundamental process in forming the curd in cheese making, and such curd is not dispersible in water and tends to be hydrophobic.

Professor Lyman was interested among other things in calcium and phosphorus metabolism and considered the possibility of removing calcium ions from cow's milk so that during gastric digestion a more hydrophilic dispersible curd would form which would facilitate digestion. Investigations revealed that this could be done by precipitation of ionic calcium by controlled addition of phosphate at a suitable pH. (It must be remembered that the concept of pH at that time was relatively new and its measurement was a major laboratory operation). The precipitate could be removed by centrifugation. Another method was by the use of natural zeolites in much the same way as these clays were used to remove calcium ions from hard water to produce soft water. Such milk produced by either procedure did indeed give during gastric digestion a soft curd which could be much more easily and completely digested. The result was that even through ionic calcium was removed, the nonionic calcium was much more available by complete digestion of the curd. The net calcium available to the infant was increased. Thus soft curd milks were inaugurated and this stimulated the growth of proprietary baby foods based on modified milks. Professor Lyman and later Professor Almy cooperated with the M. and R. Dietetics Laboratories (Later Ross Laboratories and now a division of Abbott Laboratories) makers of Similac. Professor Lyman was the patentee on zeolite treated milk or soft curd milk.

During these early years another major problem of the dairy industry attracted Professors Lyman and Almy. With Mr. Otto McCreary, they critically studied the deterioration of heat sterilized and dried milk products. The color and flavor of these products has been objectionable to many consumers. McCreary presented his Ph. D. dissertation entitled. "The Influence of Lactose on the Deterioration of Milk Powders". The deterioration in flavor and color was shown to be due to a reaction between lactose and the proteins of milk. The research was submitted for publication in the scientrific journals and was turned down by the dairy journals as being too theoretical and by the chemical journals as lacking general scientific interest. During World War II when deterioration of heated and dehydrated food became of major concern of those responsible for feeding the fighting men of the Allies, this research was "rediscovered" and found extremely significant in understanding the reactions generally involved with both flavor development and deterioration of heated foods. To this day reactions of the "browning" or Maillard type form a discreet area of research in food science and technology.

In subsequent years knowledge of ion-protein interactions in milk and milk products was extended further and to other protein foods such that today it is of unprecedented importance because of the advent of semipurified and purified proteins from soybeans, wheat or other crops as important constituents of utmost nutritional importance in present day efforts to develop low cost foods for the world's hungry people as well as new food products for the more affluent societies. Professor Almy himself pioneered developments when during World War II and at that time there were few students at the University and he worked for a time with the M. and R. Dietetics Laboratories. Lactose became quite a critical item during the early days of the war because of its use in the crash program to produce penicillin. Milk sugar was also critical for proprietary baby foods. Professor Almy applying his know-how in ion-protein interactions developed a simplified and cheaper method for preparing lactose directly from whey. In the same vein he successfully found a way to powder cream so that it would not feather in coffee, etc. Now 25 years later non-dairy coffee "whiteners" are on the shelves of every supermarket. Professor Almy is the patentee who pioneered in these fields. Mention should be made that Professor Almy also maintained considerable interest in ion-exchange phenomena which today are so commonly applied in research laboratories as well as in industrial unit operations.

Professor Lyman's interest in nutrition was broad. He not only carried on work in the nutritive values of milk and the chemistry of milk related to these qualities and calcium and phosphorus metabolism, but also in the rapidly developing area of vitamins, of protein and of lipid nutrition. A number of his students of this period went on to distinguish themselves.

Alden Raymond Winter completed his Ph. D. in 1929 on "The Nutrition Value of Blood Meal Proteins for Growth" and became a distinguished faculty member of the Department of Poultry Science until his retirement.

Thomas Scott Sutton's Ph.D. research in 1934 on "Some Studies of Nerve Degeneration Associated with Avitaminosis A in Rats" antedated even the chemical characterization of vitamin and started him on a distinguished career in animal nutrition where he did outstanding work on the nutrition of new born animals and was awarded in 1948 the Feed Manufacturers Association Award in Animal Nutrition of the American Dairy Science Association. Dr. Sutton later served as Professor and Chairman of this Department and of the Animal Science Department and served as Assistant and Associate Dean of the College of Agriculture until his retirement. It should be noted also that Professor Sutton pioneered in international educational programs where he worked in the foundation, organization and development of the Punjab Agricultural University of India and was honored in 1969 by that now thriving and leading Indian University by having a building named in his honor.

Another student, Raymond Reiser, submitted in 1936 a dissertation entitled "A New Micromethod for the Partition of Lipids in Biological Material and Its Application to the Study of Lymph and Blood and to Nerve Degeneration in Avitaminosis A." Dr. Reiser had had a remarkable career as Professor of Biochemistry and Nutrition at Texas A. and M. University where he has distinguished himself in lipid biochemistry and was elected President of the American Oil Chemists Society in 1967.

Professor Burrell during his career taught the basic biochemistry course 601. He also taught the lecture portions of the lower level service courses which consisted of elementary organic and introductory biochemistry. For these, he wrote two widely accepted texts in the early 30's - "Chemistry for Students of Agriculture and Home Economics" and "Organic Chemistry". (Professor Almy taught most of the laboratory for these courses - quantitative analysis emphasizing biological materials.) While at the same time carrying those responsibilities Professor Burrell advised all those who wished to study plant biochemistry at a time when plant biochemistry was a rather neglected area in most biochemistry groups. His only stipulation for his graduate students was that they do research on some biochemical problem involving plants. He expected his students to select problems of interest to them and then Professor Burrell worked extra hard to direct the new pioneering ventures into plant biochemistry. His philosophy of role of the doctoral preceptor is almost extinct in the last third of the twentieth century when most professors expect their doctoral students to work on problems of primary interest to the professors. Even his own dissertation shows a nutritional bent characteristic of the times, "The Effect of Certain Deficiencies on the Nitrogen Metabolism of Plants". In later years Professor Burrell and his students gave considerable attention to the vitamin C content of fruits and vegetables. An early student, James Elias Webster, submitted a Ph.D. dissertation on the "Nitrogen Metabolism in Soybeans" in 1928 and went to the Oklahoma A. and M. where he served as Professor in the Department of Biochemistry and Nutrition. Oren B. Gum was an undergraduate in the College of Agriculture who took the Plant Science curriculum and was

attracted to biochemistry and under Professor Burrell's direction did his doctoral research on "The Effects of the Minor Elements, Boron and Manganese, upon the Quality of Vegetables with Especial Reference to the Tomato (Lycopersicon esculentum)", During the war emergency Dr. Gum served in the Radiation Laboratory at the Massachusetts Institute of Technology and returned to OSU where he earned an M.D. degree. He is now Associate Professor of Medicine at Tulane University specializing in arthritis and other metabolic diseases. Another of Professor Burrell's students was Joseph E. Varner who received his B.S. and M.S. degrees from the Department of Chemistry. He and Professor Burrell were the first to use carbon-14 in biochemical research at the University. In 1949 Varner presented a Ph.D. dissertation on the "Use of C^{14} in the Study of the Relation of Malic Acid to Glucose Metabolism in Bryophyllum". The methodolgy of the chromatographic separation of the metabolic acids developed in this research became commonly used in many biochemical laboratories. Dr. Varner joined the staff of the Department where he remained until 1960 having attained the rank of Professor. Currently he is at the Atomic Energy Commission Plant Research Laboratory at Michigan State University.

President Rightmire was concerned about the University becoming too impersonal and, in the early years of his tenure, gave much attention to student counseling in the colleges and instituted the system of Junior Deans whose responsibilities are student affairs. Also he was interested in improved teaching and smaller class sizes and in the late 20's made significant progress in this direction. But much of this work was undone by the depression of the 30's when state appropriations were diminished drastically and faculty salaries were cut. The situation was made even more difficult by the anti-University position of Governor Davey in his item vetos of the budget. Many faculty members left the University or at least sought leaves of absence to work for the federal government at twice their salaries in its rapidly expanding bureaucracy associated with President Franklin D. Roosevelt's "New Deal" programs.

Simultaneously with the onset of the depression ridden 30's President Rightmire also appointed a Committee on Courses, Activity and Program composed of Professors Arthur J. Klein, Alpheus W. Smith and Carl Wittke. This group commonly known as the "Klein Committee" thoroughly studied the entire program of the University and made many recommendations for course and program improvement, modification, and, at times, elimination. From these, many changes in the University were instituted and many deletions of what some might call "fluff" were made from the total activity of the University.

In 1932 Dean Alfred Vivian retired. He had made significant contributions to the Department, College and University. He was concerned about the lack of funds and facilities for various programs in the College which he felt was not keeping pace with other institutions. Land and funds for research were

hard to come by and he was concerned that the College and its departments were not at times getting their share of the total budget for research and advanced programs compared to other segments of the university. The College of Engineering had its Experiment Station but the College of Agriculture did not have its experiment station (long since removed to Wooster) and so research and graduate programs in the College of Agriculture had a harder time. Dean Vivian did get the land problem solved and the University will ever be in his debt. There was a move to build a stadium for football and the site selected was some of the College farm land between the buildings of the College and the Olentangy River. Dean Vivian proposed at that time that additional land be acquired west of the river while it was still available and that the farm activities and the production departments of the College be moved across the river. The University did acquire land across the river west and north of the original campus-land which was and is being used as the university farm. But in 1969 the farming activity is decreasing on this land and now much of the land is being used as sites for not only the College of Agriculture but for the College of Veterinary Medicine, the new University College, and many non-agricultural research activities as well. As Dean Vivian's career came to an end, the first buildings for the College across the river became a reality.

At the time of his retirement another one of the goals Dean Vivian had set for himself seemed assured. The legislature had appropriated funds for a new building to house the Departments of Agricultural Chemistry and Dairy Technology. These two departments had made great strides in the 1920's and the limited space available in Townshend Hall had become quite inadequate - so much so that any further expansion of the activities of these departments became impossible. The site picked for the new structure was south of Ives Hall on the west side of Neil Avenue. The hard work of the Dean and Professors Lyman and Stoltz for adequate space appeared to have reached fruition as Dean Vivian gave up his stewardship of the College of Agriculture. But, alas, as the legislature appropriated funds for the new building the clouds of economic trouble appeared on the horizon and shortly after Dean Vivian vacated his office in Townshend Hall, the financial plight of the state caused cancellation of the appropriation as well as the severe retrenchment of general university activities.

The present building completed in 1952 and housing this Department and the Department of Dairy Technology was named in Dean Vivian's honor. Even before this building was built Vivian Hall was suggested by a number of people in the College but for some reason the building was simply called Agricultural Laboratories until 1958. One older faculty member attributed this delay in honoring Dean Vivian to some of the difficulties he had within the University itself on acquiring land facilities, and funds for needed programs of the College of Agriculture and in his desire to diminish the dichotomy in the University educational philosophy which often manifested itself in what was considered belittling anti-agriculture attitudes. On the occasion of his retirement Dean Vivian is reported to have formally addressed himself to these problems in a rather direct manner to the embarrassment of some of his adversaries.

After his retirement Dean Vivian gave much attention to music and until his death in 1939 collected many records of the great masters. He bequeathed these to the University and, even to this day, WOSU broadcasts concerts from the Dean Alfred Vivian Memorial Library.

Mr. John F. Cunningham succeeded Dean Vivian in 1932. He had earned his B.S. Agr. and M.S. Agr., in the College of Agriculture at the close of the century. He had specialized in horticulture but turned to journalism and became Editor of the Ohio Farmer. He served a term as Trustee of the University and then his journalistic career took him to the state of Wisconsin. Dean Cunningham's term was frought with problems of decreasing budgets associated with the depression of the 1930's and of the dislocations and adjustments necessitated by World War II following which he retired and was replaced by Mr. Leo L. Rummell.

The economic collapse of the Great Depression greatly affected the total program of the department. After a decade of rapid growth in the 1920's, the rate of progress was slowed particularly in graduate enrollment and research. Funds just were not available. Students had difficulty financing their education and the Department had almost no money for graduate student stipends and for graduate research. Professors' salaries were cut and the "dry raise" - promotion in rank but not in pay - was common in the university.

Two university connected organizations were set up in the middle 30's which were to be a great help to the Department and to the entire University. One was the Ohio State University Research Foundation which officially began in 1935 and the other was the Alumni Development Fund in 1937 although some gifts by alumni and friends had been made to the University for research prior to this time.

The Development Fund since its inception has been annually soliciting gifts from alumni and friends for unrestricted research, scholarships, fellowship, and other worthy purposes in the University. Almost from its beginning the Development Fund has assisted the department - particularly for graduate research. Mr. William R. Kenan, Jr., chemist, industrialist, and philanthropist contributed money through the Development Fund for use by the Department of Agricultural Chemistry and the Department of Bacteriology in basic research on the nutritive properties of milk. Professor John F. Lyman and Professor Harry H. Weiser of Bacteriology were in charge. Mr. Kenan had as a hobby the breeding of high producing Jersey cattle and for over twenty years he assisted Professors Lyman and Weiser and their students. Annually he would invite both professors and students involved in this work to his home in Lockport, New York for a conference on the work he had supportedat other institutions as well as at Ohio State. These conferences were usually quite delightful events and Mr. Kenan published them in the volumesof his History of Randleight Farm.

The Ohio State University Research Foundation was set up to encourage industrial and government support for university research. From very modest beginnings it is now handling many millions of dollars in research contracts for the University and its subdivisions. Several individuals and/or organizations had given funds for specified research in the University. The Research Foundation offered a device for encouraging research which outside agencies could sponsor, yet which could also serve an education function and was in a professor's field of competency and interest.

One of the early contracts was with the Sherwin Williams Co. for work with Professor Dwight DeLong of the Entomology Department and included cooperative work with the Department of Agricultural Chemistry. The project involved work on insecticides. For many years insecticides were of interest in the department and from time to time course work had been given in this field. Mr. Eugene D. Witman, a graduate student in this department, earned his Ph.D. on the project and presented a dissertation in 1939 on "A Study of Calcium Arsenate and Basic Copper Arsenate as Insecticides". So successful was this program that the Sherwin Williams project continued until after World War II. Dr. Witman became a Fellow and later joined the staff of the Department until 1947 when he left the University to assume a managerial appointment with his sponsor. This project and the work of Dr. Witman put the department in a unique position to be involved with the burgeoning insecticide industry. The late 30's and early 40's saw DDT revolutionize the insecticide industry and point the way for the development of many organic insecticides. At the same time plant hormones were being better understood and naphthyl acetic acid was found to have hormone activity. It's use in preventing the falling of apples off of trees became practical even though at that time it was quite expensive. Dr. Witman set about finding a way to produce and test this substance and for a short time he synthesized most of the available supply in the U.S.A. It was discovered by other researchers that this compound could speed the flowering and subsequent fruiting of pineapple and that it had an effect on broad leaf plants. This led directly to the use of weed controlling agents such as 2, 4 dichlorophenoxyacetic acid and its derivatives so commonly used today. Thus the Department was involved in these important and exciting new developments of utmost importance which we take for granted today.

During the late 30's the discipline of biochemistry had become well established and in many universities departments were so identified with many departments of Agricultural Chemistry changing their names to Department of Biochemistry for indeed they were essentially biochemistry groups. The truly outstanding department of Agricultural Chemistry at the University of Wisconsin became the Department of Biochemistry when Professor Conrad Elvehjem became its chairman. (He later became President of the University of Wisconsin). Even such an eminent group as that was beginning to notice problems in communication with and identification by non-Land Grant colleges which sent many graduate students there. The term agricultural chemistry more and more denoted the chemistry of fertilizers, soils and pesticides.

Although not too much of a problem at Wisconsin, some departments of Agricultural Chemistry in some schools where colleges of medicine were located ran into some considerable opposition to the change in name because colleges of medicine were becoming aware of the importance of biochemistry as the basic discipline on which much of medicine depends. This was in spite of the fact that generally many medical schools used the term physiological chemistry and were not concerned with other areas of basic and applied biology where biochemistry was equally important.

It is only logical that both applied biological fields - medicine and agriculture should depend heavily on biochemistry. In some institutions where departments of chemistry were becoming increasingly aware of biochemistry, these groups offered opposition to departments of agricultural chemistry becoming identified as departments of biochemistry. At the Ohio State University there was opposition to a change in name of the Department of Agricultural Chemistry to the Department of Biochemistry. from both the Department of Chemistry and the Department of Physiological Chemistry, Pharmacology and Materia Medica and their respective Colleges of Arts and Sciences and of Medicine.

Very formidable biochemistry departments had developed at Wisconsin Cornell, Minnesota, Illinois, Purdue, and California. In the late 30's all had highly respected graduate teaching and research programs supported in a large measure by their agricultural experiment station funds. (To this time the Ohio Agricultural Experiment Station (Ohio Agricultural Research and Development Center) has no biochemistry group as such although an abortive try was made in the early 1960's). But the Ohio State University had no experiment station, and with years of meager financial support and with only a faculty of three - Professors Lyman, Almy and Burrell, the Department of Agricultural Chemistry and the University in general did not compare favorably in their biochemistry program with the biochemistry programs the above mentioned universities. Indeed it is a great tribute to these three professors that beside all of the undergraduate and graduate course work they were responsible for 16 earned M.S. degrees and 7 earned Ph.D.'s in the decade 1931-1940.

The continued increase in enrollment and the easing of the economic binds of the State in the late 30's stimulated the College and University to reinitiate moves to build a new building in which the Department would be housed. The progress other universities were making in their biochemistry and nutrition programs would be impossible to approach at the Ohio State University with the limited space in Townshend Hall. For the second time the dreams of Professors' Lyman, Almy and Burrell for new and expanded facilities appeared near relization because the legislature appropriated again money for a new building. However, before plans could be redrawn and contracts let World War II forced cancelation of the project. And so progress received another stunning blow.

Not only were Professor Lyman and his colleagues concerned about Ohio

State's position in biochemistry and nutrition but also was Dean Alpheus Smith of the Graduate School. The Development Fund designated a small sum in 1940 to the Department for seed purposes in the hopes that additional funds would be attracted to the Department. The money given was sufficient to support a graduate student and to provide badly needed equipment in order to stimulate growth. Because of the very poor economic position of lard, the Kroger Co. which had large meat packing interests set up a project in the Department under Professor Lyman's supervision and through the Research Foundation to determine if something could be done to upgrade lard. This project provided for a postdoctoral Research Fellow and Fred E. Deatherage was hired for the post. He had earned an A. B. from Illinois College, an A. M. from the University of Illinois and a Ph. D. at the University of Iowa and had served as Instructor in Biochemistry at Iowa for two years and his research on fats with Professor H. A. Mattill at Iowa was excellent experience for the new research venture. The department now had two full time postdoctoral Research Fellows - Eugene D. Witman being the other.

Progress on the Kroger project was rapid because of the cooperation of many interested people with the result that a new process was developed for making a high grade refined land in a single operation which led to a patented process. But World War II called a halt to this work after two years and Deatherage went with the Kroger Co. in their Cincinnati laboratories for the duration of the war where he was concerned with research on military rations, and on fats and oil and on meat, and he returned to the Department as Assistant Professor in 1946. Due to the fact that the Kroger Co. decided to go out of the meat packing business after the war, the lard patent was given to the Research Foundation which in turn sold it to the Rath Packing Co. where, after further development work, the process was put to use.

An incident in the laboratory might serve to describe the condition of the facilities in Townshend Hall in 1941 and the level of financial support that the University and particularly the Department was experiencing as the result of the depression.

At about 1 p.m. on a beautiful spring day in 1941, I had an accident - about 5 liters of acetone splashed from a broken separatory funnel to a hot plate and caught fire. The burning acetone started running through the cracks in the floor setting fire to floor and furniture while at the same time burning droplets of acetone were dropping to the floor below. A student Mr. Howard Moore was trapped behind the fire with windows as his only avenue of escape, if necessary. I tried to use two old vintage bicarbonate fire extinguisher which functioned by forcing a metal plunger to break a bottle of sulfuric acid to set off the extinguisher. Neither extinguisher worked because the plungers were corroded to the wall of the extinguisher. With the fire getting a bit out of hand we tried the 2-inch fire hose near-by even though we knew that everything below would flood because of the wide cracks in the single plank floors of old Townshend Hall. On turning the valve we found that the hose was so old that all the water went through the sides and none through the nozzle. In desperation I told Mrs. Joseph Katzenberger, department secretary and wife of a graduate

student, to call the fire department. Eight or nine fire trucks came up Neil Ave. to the delight of students going to their 1 o'clock classes. While waiting for the firefighters we decided to use as a last resort two carbon tetrachloride fire extinguishers we had found even though we knew that carbon tetrachloride was not good for solvent and fat fires. The result was a cloud of phosgene and Mr. Moore took refuge on the outside second story ledge of Townshend Hall. With buckets and laboratory jars we carried water to keep the fire from getting to far out of hand. The firemen finished the job. In a short time a number of university officials appeared and I explained what happened. Whereupon I was reprimanded in rather severe language to the effect that I should have called the Service Department for permission to call the Columbus Fire Department or have them do it. I was taken aback particularly since we found the fire equipment of Townshend Hall nonfunctioning. So being young I wrote a letter to the President stating the facts as I saw them and pleading that something be done for better fire protection. As a result we did get the department's first liquid carbon dioxide fire extinguisher. But in writing the letter I had offended Professor Lyman and it was the only time I ever saw him the least bit angry in my 24 years of association with him. And I was sorry as he only said to me that I should not think that I was the first to point up to the University authorities the lack of effective fire fighting equipment in Townshend Hall. He had done it many times without success and for many years. He had harbored a fear that fire would severely damage or destroy Townshend Hall, injure students and faculty and with it the Department of Agricultural Chemistry.

At the time of the above incident Howard L. Bevis was completing his first year as President of the University. President Rightmire had retired in 1938 and Professor William McPherson long time Dean of the Graduate School and Professor of Chemistry who began his career with Professor Henry A. Weber became Acting President until President Bevis was inauguarated. In recognition of Dr. McPherson's half century of service climaxed by this final assignment as Acting President, the Board of Trustees gave him the title of President Emeritus. President Bevis, a lawyer and a judge had served on the Ohio Supreme Court before going to Harvard as Professor of Law. It is from this post that he assumed the presidency of The Ohio State University.

The war caused a precipitous drop in enrollment and in funds for the University. A large segment of the university became involved in the war effor effort. Professor Lyman and Burrell carried on the Department's program while Professor Almy was granted a leave of absence to work with the M. and R. Dietetics Laboratories who were heavily involved with supplying the military as well as maintaining their own business. At this time many professors took leave to aid in the war effort in their respective specialities. Some went with industry, some with various branches of the government and some went full time on war projects on the campus. The War Research Building was constructed for much of his work.

During this time Professor Lyman and Professor Wesley France of the Department of Chemistry were asked to jointly develop a program on the problems involved in making sponge rubber under the immediate auspices of the General Motors Corporation. On the surface this appeared far from biochemistry, nutrition or food chemistry. These professors were chosen because of Professor France's expertise in colloid chemistry, and Professor Lyman's in food chemistry for he had at one time done some work on leavening agents and was quite knowledgeable in the problems of in bread and sponge cake from work associated with his long time interest in the nutritional properties of bread, whole wheat and white flour. Dr. G. Horace McFadden and Dr. Amos Horney were key personnel involved in this project which continued for a short time after the war.

The rush of students to the universities after the war was even more sudden than the drop in enrollment during the war. Great numbers of veterans who had had their education interrupted were urged to go to school through the government support of the G.I. bill. These plus the normal enrollees stretched the universities to the limit. Ohio State was no exception. Here too, where almost no new buildings had been constructed for almost twenty years, the situation was quite critical. So also was the situation in the department at both undergraduate and graduate levels. Drs. E.D. Witman and F.E. Deatherage were added to the staff in 1946 and with Professor Almy's return the faculty of the department became five full time members. Furthermore up to that time the staff had been on three quarter contracts but were put on a year round basis to take care of the on rush of students.

During the war years the Department made adjustments in courses to anticipate the new needs occasioned by the war. The enrichment of bread with vitamins and the food shortages of the war focused attention on nutrition and on food science and technology. The College of Agriculture set up new curricula in these areas and this meant more emphasis in the courses of the Department. Two new courses "The Chemistry of Vitamins", 621, and "The Chemistry of Foods and Food Processing", 613, were introduced and became quite popular. In 1947 the vitamin course was given both Spring and Summer Quarters because of critical shortage of classroom and laboratory space. These courses were taught by Professor Deatherage and another new course "Horticultural Chemicals", 610, by Professor Witman was equally popular because of wide interest in insecticides and plant growth regulators.

The expanded offerings of the Department and the new curricula in nutrition and food technology offered more opportunities for undergraduates to be majors in the Department; but even so, the 30-hour rule was still rigidly adhered to and the problem of getting sufficient foundation courses for a general curriculum for students interested in biochemistry remained. For undergraduates the department could offer only the Plant Science, Animal Science, Nutrition and Food Technology curricula and in spite of the fact that biochemistry as such was becoming ever more important, the department had the old intramural hurdles to thwart its progress.

Dean Cunningham retired in 1947 and Mr. Leo L. Rummell became Dean of the College of Agriculture at that time. Dean Rummell had earned his B.S. in Agr. and M.S. from the Ohio State University. For a time he served as Editor at the Ohio Agricultural Experiment Station and then joined the Ohio Farmer. He was very effective speaker and served as speaker for the Farmer Institutes throughout the State and became recognized as leader in agricultural affairs. He joined the Kroger Co. as Director of Public Relations and it is from this position that he accepted the deanship. Dean Rummell had served a seven year term 1939-1946 on the Board of Trustees of the Ohio Agricultural Experiment Station and the Ohio State University and knew well many of the problems affecting these institutions. In accepting the post of Dean of the College he also significantly accepted the Directorship of the Ohio Agricultural Experiment Station at Wooster. This is the first time in Ohio's history that this was done - more than 80 years after the Hatch Act - whereas in other states Dean of the College of Agriculture and Director of the Experiment Station were one and the same. So a major policy of Dean and Director Rummell's administration was to bring the two institutions together in coordinated programs of research and teaching where department chairmen would be common in the two institutions. Under Dean Rummell the College of Agriculture of the University and the Ohio Agricultural Experiment Station would reach new heights of excellence, respect, and admiration both within University and outside, in the state of Ohio and on the national scene. The Department itself would achieve new heights with the encouragement and support of Dean Rummell.

With the end of the war and the critical need for more classroom, laboratory, office and library space a building program was initiated in the University which to this day has not subsided. Hughes Hall for the School of Music and a new building for Agricultural Chemistry and Dairy Technology were first to be undertaken followed closely by the first unit of the new physics building now named in honor of Alpheus W. Smith, Professor, Department Chairman, Dean of the Graduate School and academic statesman and a friend of this Department.

At least the dream of Professors Lyman, Almy and Burrell appeared to be on the road to reality after the third appropriation for a new building for the Department was enacted almost twenty years after the first legislative approval. In a manner so characteristic of Professor Lyman, who realized that indeed he must retire before the building he so longed for would be a reality, decided that he would relinquish his Chairmanship to a younger man so that a new chairman and the professors who would be using the building could exert their influence in the design and layout of the new building so as better to take care of the needs of the immediate future. So at the age of 66 and after being department chairman for a third of a century he relinguished his administrative responsibilities to his former student and then a Professor of Animal Science, Thomas Scott Sutton. It was fitting indeed that Professor Sutton succeed Dr. Lyman as he was an outstanding teacher and investigator in animal nutrition who had gained national stature.

Although Professor Lyman remained active on the faculty until he retired in 1952, Professor Burrell until his retirement in 1958 and Professor Almy until 1960 the period of 1923-1948 was for the Department to which they devoted their lives the era of Professors Lyman, Almy and Burrell.

VII. A DOZEN POST WAR YEARS OF GROWTH AND CHANGE

Coincident with the transfer of the Chairmanship of the Department from Professor John Franklin Lyman to Professor Thomas Scott Sutton these professors made a concerted effort in 1947-48 to change the name of the Department from Agricultural Chemistry to Biochemistry. This was ten years after the country's leading biochemistry department at the University of Wisconsin had done so and other departments similar to ours were doing so. The program of our own department emphasized biochemistry and nutrition and it was increasingly difficult for the department to be identified with its actual academic program for the meaning of the term agricultural chemistry had changed in its common usage. This request met opposition from the Department of Chemistry and the Department of Physiological Chemistry, Pharmacology and Materia Medica as well as strong opposition from the College of Arts and Sciences even though it had no program in biochemistry nor did its Department of Chemistry. Although that College had nothing in the area, nor any biologically oriented department except Bacteriology, it wanted to preempt the increasingly popular field for itself in case it wished to start a department of biochemistry. The Academic Vice President and his appointive Council of Instruction nuturing the continuing anti-agriculture belittling ("cow college") sentiment frequently expressed across the campus - the old dichotomy so often evident in university's academic and operational philosophy as to what a university should be - turned down the Department's request to change its name in spite of the trend in other universities across the country. However, admitting that the University was indeed deficient in the area of biochemistry they did permit a change in identification to the Department of Agricultural Biochemistry. This new name was some improvement for it did acknowledge that in reality the Department's program was biochemistry; however, the emphasis on the adjective was to prove misleading and confusing in identification and communication with other colleges and with granting agencies upon which the Department was to depend for funds; then too, confusion of the Department's program even within our own university was to continue. A short time later when an official attempt was made to have the basic biochemistry sequence of courses listed officially in the Bulletin of the College of Arts and Sciences so that biochemistry as a basic science of increasing importance could be at least presented to the uncommited mass of students registered in that college, the Department's request was turned down by Curriculum committee of that College. Their Dean wrote a letter to the effect that although the Department of Agricultural Biochemistry may have made their courses more fundamental and less applied, they still were too applied to be suitable for that College's approval for their students.

The end of the war had not only brought an on-rush of American veterans and non-veterans to all universities and colleges throughout the country but also brought a great number of foreign graduate students. This was true also for the Department of Agricultural Biochemistry and the high percentage of foreign students would be maintained for many years to come and

consequently the Department would have a stimulating cosmopolitan atmosphere. At one time in the middle 1950's the Department's students and staff had competency in 14 languages.

The increased enrollment brought some increase in funds and also the need for more staff. Increased graduate enrollments presented problems of space and money for graduate research. Associate Professor Eugene D. Witman elected to go in 1947 with the Sherwin-Williams Co., the sponsors of the research programs through the Research Foundation in which Professor Witman had been involved for the previous decade. He later affiliated with Pittsburgh Plate Glass Co. He has continued to maintain a keen interest in the Department and the University. The faculty of the Department remained at five (Sutton, Lyman, Almy, Burrell and Deatherage).

1948 brought another change in the Department. In Dean and Director Rummell's policy to bring Experiment Station and University closer together, the first direct involvement of faculty of the Department in the research programs of the Experiment Station was the part time appointments of Professor Sutton and Associate Professor Deatherage to the Station staff. At last, more than 60 years after the Hatch Act and more than 50 years after the move of the Station away from the University the proper arrangements between the institutions so profitably manifest in other states, was beginning in Ohio. This mutual University-Station support permitted full year appointments for both Sutton and Deatherage. The Station had no biochemistry group as such and so both were appointed to Animal Science but this was in keeping with Professor Sutton's interest in animal nutrition and Associate Professor Deatherage's interest in the biochemistry of muscle as meat. This affiliation meant not only that a small amount of salary money from the Station was available but also there was some support for research involving professors and graduate students. Furthermore, the complementary nature of Station and Department (and University) programs would mutually stimulate quality and breath of the programs at Wooster and at Columbus. Professor Sutton's talents would soon be more productively used in addministration but the Station relationship was to be more fruitful for Professor Deatherage and his colleagues.

The close working relationship between Professors L. E. Kunkle and Vern R. Cahill of the University's Animal Science Department and Professor Paul Gerlaugh, the Station's nationally respected authority on animal production, immediately permitted some outstanding investigations into the biochemical and physiological nature of quality in meat. Soon Professor Harry H. Weiser of Bacteriology and some of his students actively and very significantly cooperated in this work. That we should dare try to understand the basic nature of meat quality and even question some of the lore of traditional livestock pursuits brought attention to the whole group. One result was that Professor Deatherage, on occasion of the American Chemical Society's Diamond Jubilee, in 1951, was asked to speak on the

subject before the Division of Agricultural and Food Chemistry of the American Chemical Society. Another result was that a professor of Iowa State College visited the campus and inquired of Professor Deatherage how we could do such research and all keep our jobs. At the time Iowa State College (University) had dismissed a professor over the margarine-butter issue and such conservatism was creating some hardship among Iowa State's faculty. One of the author's happiest incidents was to point to the vision and support we were getting from Dean and Director Rummell and his adminstration. After all, Ohio was an urban state with a strong agricultural economy and the College of Agriculture considered that it had a mission to perform for the urban consumers as well as to the rural producers. It must be added that in face of conservative backwash in subsequent years, this support continued until Dean Rummell retired and the comprehensive meats research program at Ohio was setting the pace.

The pioneering experiments by Schoenheimer on the use of isotopes in the middle and late 1930's showed that isotopes were indeed very powerful research tools in biochemical investigation. Following the war and the excitement of the atomic bombs the Atomic Energy Commission began to make available isotopes for research. The first use of isotopes in the Department was the use of deuterium by Professor Deatherage and his students Mr. Roger Max and Mr. Nurul Absar Khan working on the antoxidation of fats with the helpful cooperation of Professor M.S. Newman of the Department of Chemistry and Professor J.B. Brown of the Department of Physiological Chemistry, Pharmacology and Materia Medica and the use of C^{14} by Professor Burrell and his student Mr. Joseph E. Varner who were working on the intermediary metabolism of plant tissues. The former were helped by funds from the Development Fund and the Graduate School and the latter were assisted by the Kettering Foundation. Now in 1969, isotopes are, of course, of such common usage that students and younger staff members can hardly appreciate working without them in many areas of biochemistry.

The pressure for expansion of activities and for more funds is seen in the fact that whereas in the 1941-1950 decade 24 master's degrees and 24 doctorates were earned, the last five years, 1946-50 inclusive, accounted for 18 of the M.S. and 15 of the 24 Ph.D. degrees. The lack of funds for graduate research and for graduate student stipends was very severe for the Department. From regular university funds there was considerable disparity in monies allotted to various departments for graduate student support. Relatively the Department of Chemistry was much more favorably treated by the University Administration than the Department of Agricultural Biochemistry. Fortunately in the late 40's and early 50's the faculty members of this department were able to tap a few outside sources. The assistance of the Ohio Agricultural Experiment Station did indeed help. Other assistance came from Mr. William R. Kenan, Jr. the Kettering Foundation, and the Development Fund. A grant sufficient to support a

graduate student was made by the Nestlé Co.

Dr. R.W. Titus, former professor of chemistry at Kansas State College (University) and at the time Director of Research for the Nestlé Co. at Marysville, Ohio and developer of the first commercially successful soluble coffee, was concerned about the dearth of fundamental information on the chemistry of coffee. Dr. Titus through his interest in dairy products was well acquainted with Professors Lyman and Almy and the Department. Through Dr. Titus' urging the Nestlé Company gave a sum of money for unrestricted use on the chemistry of coffee. Because of Professor Death-erage's involvement during the war in some coffee problems, he was made responsible for the grant and elected to investigate the non-caffeine nitrogenous constituents of the green unroasted bean. With Mr. Gerald Underwood, an M.S. student in organic chemistry of Professor M.S. Newman as Graduate Fellow, a very significant piece of work was done on the characterization of the proteins in coffee. Although this Nestlé project terminated shortly after Dr. Titus' retirement it proved to be a truly seed project in that it brought other support to the department. Mr. Underwood in his doctoral research was concerned about the amino acids in various proteins of coffee. He had heard early oral reports of the ion exchange chromatographic technique for amino acid determination being developed by Drs. Stanford Moore and W.H. Stein of the Rockefeller Institute and decided to try to use their technique even though very meager information was available to him at the time. This was successful. Bothered like many investigators by the humin formation associated mineral acid hydrolysis of proteins, Mr. Underwood decided that, if the ion exchange resin, sulfonated polystyrene, could be used for chromatography because of its affinity for amino acids, perhaps the resin might also serve as a catalyst for hydrolysis instead of mineral acid and thus avoid undesirable side reactions. He tried it on casein and some other proteins including those of coffee and it worked. This was reported in his dissertation and in a note to Science and in subsequent papers in Food Research. Dr. Underwood joined the Upjohn Co. and has become an outstanding virologist. But this was not the last of it. Based on the ideas developed in this work the Herman Frasch Foundation granted a five year project in which Dr. Jack C. Paulson and Dr. John R. Whitaker later earned doctorates on protein hydrolysis by ion exchange resins. Dr. Whitaker's imaginative research showed that the resin was acting similar to an aminopeptidase. Dr. Whitaker has since distinguished himself in the area of proteases, protein characterization, and chromatography theory and practice. He is now Professor of Food Science at the University of California at Davis. Furthermore, the Frasch Foundation has continued to support research in the Department ever since its first grant in 1951 and this Foundation and its grants have been of extraordinary value in the total departmental program because the flexible nature of the grant has opened new avenues which have attracted additional support from other agencies.

Some aspects of nutrition, food science and technology were taught in many departments of the College of Agriculture and in the College of Medicine.

The war had accentuated interest in these areas but funds were lacking and the university structure was not conducive to a concerted effort in these areas. This was unfortunate because in 1969 many leading universities have thriving departments of nutrition, food science and technology. In order to focus interest, faculty members from various departments established with approval of the Board of Trustees an Institute of Nutrition and Food Technology and Professor T.S. Sutton was made Director in 1946 and he continued in this capacity when he became Chairman of the Department of Agricultural Biochemistry. Curricula were established in Nutrition and in Food Technology in the College of Agriculture and some funds were made available to the Institute by the Development Fund for the initiation of faculty-graduate student research projects. The curricula were of some help to the Department because they were flexible enough to permit undergraduates to get more basic courses given in other colleges and still not violate the sacred 30 hour rule. Then, too, though funds were very limited, some money was made available to the department for research. The Development Fund supported this program of the Institute for a number of years, but, even so, the needs were too great and any department cooperating in the Institute was able to get usually only one to two thousand dollars per year. The Institute continued to operate in this essential manner for a number of years. Professor John Bernis Brown, Department of Physiological Chemistry succeeded Professor Sutton as Director in 1950 and retained this post until 1963.

Professor Sutton relinguished his Directorship of the Institute of Nutrition and Food Technology when he was asked by Dean Rummell to accept the responsibility as Assistant Dean of the College of Agriculture in addition to his duties of Chairman of the Department of Agricultural Biochemistry. This was to begin Professor Sutton's 17 years of distinguished service to the College in academic affairs. In 1951 Professor D.J. Kayes, Chairman of the Department of Animal Science retired. Professor Kayes was a renowned live stock judge and full of the traditional lore of the livestock breeder and the show ring who was at times not too understanding or sympathetic to the role of the basic science of nutrition in relation to the classical livestock industry dominated by the vested interests of the breed associations. Professor Sutton's research and teaching of nutrition had attracted attention even though he was never encouraged in this work by Professor Kayes, yet Dean Rummell requested Professor Sutton to assume the Chairmanship of the Department of Animal Science. So in 1951 Professor Sutton became Assistant Dean of the College of Agriculture and Professor and Chairman of the Department of Animal Science. Although he was chairman of the Department of Agricultural Biochemistry for only three years he did have a considerable impact on its growth and development and from his responsibilities of Assistant and later Associate Dean he continued to contribute greatly to Department's program and assist in helping solve many of its problems.

Associate Professor Fred. E. Deatherage was promoted to Professor and Chairman of the Department in 1951 at a time of continued expansion. It was considered by the faculty before Professor Sutton left the Department

that our program needed strengthening in the area of enzymes and intermediary metabolism of both plants and animals. Through the Kettering Foundation Dr. Joseph E. Varner continued working in the Department after receiving his doctorate in 1949, and, in 1950, he was made Assistant Professor and would work in the area of plant biochemistry, continuing his interests in intermediary metabolism. Dr. Richard Owen Moore joined the Department as Assistant Professor in 1951. He had been a Rector Scholar at DePauw University and went into the military service following his B.S. degree in 1942. After the war he earned his Ph.D. degree at Cornell University under the direction of the great Nobel Laureate, Professor James B. Sumner and Professor W.L. Nelson. So at the beginning of the academic school year of 1951-52 the staff of the Department included Professors Lyman, Almy, Burrell and Deatherage and Assistant Professors Moore and Varner.

During the period 1949-52 the Department, although extremely busy with mushrooming enrollments at all levels, happily accepted the additional problems of planning and ordering equipment for their new building to be shared with Dairy Technology. Finally, after the war and the legislature's third appropriation (the first was in the early 1930's and the second just before World War II) a new building for the Department was to become a reality. But there were still problems. The rush to build, inflation, changing architects who depended too much on the two old sets of plans drawn following the two previous appropriations and the rapidly changing directions of teaching and research in biochemistry presented difficulties. At times it appeared that the needs of the department were being ignored and too often our suggestions were not followed. Having suffered with too much heat in Townshend Hall we were anxious to avoid this in our new building but to no avail. The steam distribution system was put over our chemical supply stores. With its uncovered valves handling 200 lbs. pressure the floors for these rooms were too hot to walk on let alone work in and use as chemical stores. This was overcome somewhat by foot thick insulation on the underside and a special vent to the roof from the basement. But to run the dairy a high pressure steam line was run the full length of the basement corridor and so to this day we are still too hot and the heat problem necessitated continuing alterations for a number of years as funds could be obtained from whatever source. The University architects would not allow our requests for cold rooms so important for enzyme work even though Dairy Technology had a super abundance of such rooms for ice cream, milk, cheese, etc. Still concerned in 1952 as the building was being finished we finally got a hearing with Vice President and Business Manager Jacob B. Taylor, who decided that our request for at least one cold room should be allowed. So a section under the lecture room was converted to a cold room for laboratory manipulations.

It will be recalled that Dean Vivian started the movement of the College of Agriculture across the Olentangy River. Plumb Hall for Animal and Dairy Science and the Poultry Building were in use long before World War II.

Although originally planned to be located on the west side of Neil Avenue at 19th Avenue, it was decided to build the new building for the Department in the bull pasture on Fyffe Rd. between Stadium Drive and Lane Avenue. Although this was indeed a proper decision for the College of Agriculture, most of the faculty of the Department opposed this move on the basis that we were attempting to serve the entire university because biochemistry was a basic science; that we were being removed from the many departments with which we worked closely; and that the Departments of Chemistry and Physiological Chemistry and Agricultural Biochemistry would be at the three corners of an equilateral triangle with sides of 1 1/3 miles. At one time, the author suggested to the University Architect that he might leave the Department in Townshend Hall with the space we had and the space that the Department of Dairy Technology would vacate. Then with one third of the money for the new building, he could remodel and fireproof Townshend Hall for us. We would then be able to accomplish more for the University. His reply was simply "Young man, you do not know how to run a university. Townshend Hall is to be leveled to the ground soon." In 1969 it remains as strong as ever-remodeled and fireproofed for the most part. In spite of the location, our new quarters were better laid out for more efficient use although in terms of square feet available we were no better off and would soon be as over-crowded as ever. Then too, our new location was often to be used in later years by the Academic Vice President and others who repeatedly refused to help solve some of our academic problems by insisting that we were too far away to serve the University in the general area of biochemistry.

The new building to house the Department of Agricultural Biochemistry and the Department of Dairy Technology was ready for occupancy in the summer of 1952. But sadly for Professor Lyman he would not benefit directly for his many years of effort to obtain satisfactory quarters for the Department. His seventieth birthday was February 20, 1952. I accompanied this highly respected faculty member to lunch that day. I whispered to Mrs. Mildred Hull, Faculty Club manager who was at her customary place at the door of the main dining room, that it was Dr. Lyman's birthday. She was a good friend of Dr. Lyman, both having ties to Westerville, and I was surprised because she said nothing and only suggested that we sit at a vacant large table in the center of the dining room. We had often lunched with colleagues at this table. She then went to the kitchen as if something urgent required her attention. As Dr. Lyman finished lunch, Mrs. Hull brought him a small birthday cake decorated with a single candle. She had hurriedly asked the cooks to arrange a cake of some sort to help her and all his friends at the table to wish him "happy birthday". Dr. Lyman was a member of the "Anvil and Bellows Club" a group of faculty who meet in the lounge at the Faculty Club after lunch almost daily to discuss in fun and with poignancy university affairs - unofficially and off the record, of course. So on his 70th birthday the A. and B. "boys" who had seen the cake presented in the dining room also honored him following lunch. Though such occasions were happy ones there was also sadness for the members of the "Anvil and Bellows Club" had often discussed the difficulties facing faculty members at retirement for

the University did not have at that late date an adequate retirement program for retiring faculty. It would be only few years more and the University retirement program would be quite sufficient, but, alas, Professor Lyman would not benefit. How tragic for him and others like him!

Another incident involving Professor Lyman indicates something of his personality and of the salaries of university professors at the Ohio State University during his years of service. On a beautiful spring payday during his last quarter of service to the University, I accompanied Dr. Lyman to lunch. As we walked past the new library being finished on our way to the Faculty Club he said, "Fred, this is a great day in my life." It was a rather ordinary school day and I asked in astonishment. "Why? What's the occasion?" He simply said, "I'm going to the bank after lunch and finish paying off my mortgage. My house is finally mine".

Although he was offered an office in the new building known at the time as the Agricultural Laboratories Building, Professor Lyman chose not to maintain an office on campus. Shortly after his retirement he and Mrs. Lyman and son Russell moved to Indianapolis and later to Youngstown to be near his daughters and their families. His health continued remarkably good until suddenly he was stricken and died of a heart attack November, 1963. Thus came to an end a career of a man affectionately devoted to his family, his students, his colleagues, his university and his community. He was not only active in university affairs but those of the First Congregational Church and served on the Board of Trustees of the Gladden Community House for many years.

The Agricultural Laboratories Building was occupied by the Department of Agricultural Biochemistry and Dairy Technology during the summer of 1952 and the staff of five and their graduate students were occupied for several hectic weeks getting everything in order to meet classes, get laboratories ready for teaching and to resume research interrupted by the move. There was no official dedication or opening of the building on the part of the University or College. The department had no funds to inaugurate the building but when the Department's facilities were in working order the Department held a modest open house for faculty members of closely related departments with the five staff members sharing the cost.

The costs of research for graduate students, for graduate student stipends and for teaching equipment were increasing and the financial situation was becoming more acute because the university itself had insufficient funds to support these necessary activities. It was becoming increasingly clear that the faculty members themselves would have accept increased responsibility for getting funds from outside sources, particularly to support, almost completely, their own research and that of their students. The only avenue open to the staff was through research grants and contracts if we were to continue to drive ahead to create a general biochemistry program commensurate with that of other universities. And in many respects we had a long way to go and would need all possible support from the College of

of Agriculture and from the University itself. From the College we obtained strong moral support for our program and financial help as funds permitted. But unfortunately at the University level time was to show that those responsible for academic affairs would not be too helpful in some critical areas.

Fortunately the quality of the students and of the research being conducted in the Department began to attract attention. The Nestle and subsequent Frasch grants have already been mentioned. The Kettering Foundation continued and increased their support of the work of Professor Burrell and Assistant Professor Varner. Work on the biochemistry of meat which was supported to some extent by the Ohio Agricultural Experiment Station brought attention to the Department, because with the cooperation of Professor H. H. Weiser and his student Mr. Barney Lepovetsky of the Department of Bacteriology the nature of deep spoilage in meat was elucidated. This traditional and often studied problem had been a mystery and its solution was essential in order to develop new avenues of research upon which new industrial processes would depend. Then, too, we were beginning to question some of the traditional ideas concerning meat by applying biochemistry, nutrition and physiology to long standing meat problems. Kingan and Co. were attracted to this work and, particularly so, because of the imaginative work in that company of Mr. Howard Ned Draudt, one of our M.S. students. Kingan granted $25,000 for uncommitted research on meats. In addition Kingan later sent Mr. Draudt back to earn a Ph.D. and covered all of his expenses in doing so. The original Kingan grant permitted additional basic work on the nature of muscle proteins, the nature of rigor mortis and the possibilities of vascular modification of tissues. In some of this work antibiotics had been used as research tools and were far more effective than expected from available information in preventing the growth of spoilage organisms in meat. This later attracted support from the American Cyanamid Co. The biochemistry of meats program was to attract additional support from the U.S. Department of Defense for work on muscle protein hydration, dehydration, and rehydration and from the U.S. Departments of Agriculture and of Commerce on the biochemistry of bruised tissue or, fundamentally, the biochemistry of wound healing.

The progress of the plant biochemistry work was such that the Kettering Foundation granted to Assistant Professor Varner support to permit him a years study in 1953-1954 at the California Institute of Technology with Professor James Bonner. Upon Professor Varner's return he was promoted to Associate Professor and shortly he received additional support for his work from the Research Corporation which was embarking at that time o supporting promising young professors in basic science. In the course of their grant officials of the Research Corporation made a detailed study of the Department's program particularly since the grant was for basic science and yet, was to a Department of Agricultural Biochemistry - a department from its name they had at first assumed to be concerned with fertilizers, soil, feed analysis etc. They expressed to us concern about the misleading name of the Depart-

ment, - particularly in view of the fact that there was no general department of biochemistry nor no division of biochemistry of the Department of Chemistry at the Ohio State University. We in the Department of Agricultural Biochemistry had been no less concerned.

This problem of proper identification of the Department was not only one between the Department, other colleges and universities and outside granting agencies unfamiliar with the peculiarities of the Ohio State University but a problem within the university itself. Prospective student inquiries concerning biochemistry were often ignored or returned because the, "University has no Department of Biochemistry". Prospective graduate students who had even made application for admission specifically to the Department were turned down because the prospective students were not graduates of an agricultural school even though they may well have been a highly qualified students.

At this time problems other than that of identification became more severe - too few faculty to do the job which had to be done; establishing an undergraduate major program to point up the area of biochemistry to the great mass of undergraduate students; the need for unified course offerings; and providing adequate equipment. So in order to solicit the University's help a report was presented in late 1954 to the University Council of Instruction and the Academic Vice President entitled, "The Instructional Program in Biochemistry at The Ohio State University and Suggestions for Its Improvement". This report indicated that a "Department of Biochemistry must provide:

"1. Service teaching at the undergraduate level.
2. Counseling of students on the undergraduate level as well as on the graduate level
3. Service teaching at the graduate level
4. Graduate instruction at the professional level"
5. An active and broad research program",

and that the Department of Agricultural Biochemistry was well on the way to supplying this need.

Before making the formal request to the Council on Instruction the problems the Department was facing were explored informally with many in various sectors of the University. Dean and Professor Emeritus, Alpheus W. Smith, had always been interested in stimulating the growth of biochemistry on the campus. It was natural that we should seek his help as the most respected academic statesman at the University. He had had similar experiences in his building the Department of Physics from a group in the early days in the College of Engineering who were expected to do only service teaching to budding engineers to a comprehensive university-wide Department of Physics of considerable stature both on and off campus. He had served on the Klein Committee of more than twenty years ago - a committee to carefully examine the entire program of the University so as to weed out the superficial and give purpose and direction to the total University effort.

In one of our meetings, Professor Smith took the author into the cool darkened auditorium of the New Physics Building which now in 1969 bears his name because his office was uncomfortably hot and bright and his eyes were failing. He candidly described his own career and the problems he had encountered noting that, in the early years, the College of Engineering had been unsympathetic to a comprehensive program for physics, and that in order to overcome some of these limited attitudes, he had been active in the transfer of the Department of Physics to the College of Arts and Sciences which when it took place nutured the growth of physics. But Professor Smith indicated that support from Arts and Sciences had deteriorated and now in 1954 the College of Engineering was much more progressive and broad in its educational philosophy. Professor Smith prophecied bitter intercollege opposition for us because we were in the College of Agriculture. But he advised that as chairman I should vigorously prosecute our position for a comprehensive biochemistry program for that was the responsibility of the chairman of a department of biochemistry in a comprehensive university.

Using his own experience he further advised that we should not concern ourselves with change in college so long as the College of Agriculture was supporting the Department to the best of its ability and from a truly liberal educational philosophy in comparison with the other alternative, the College of Arts and Sciences. On this point he advised me to make a detailed comparison of the kind of support that that College was giving to the science departments in its jurisdiction and the only biologically oriented one was the Department of Bacteriology. Professor Smith indicated what the Department of Agricultural Biochemistry knew, that we must move ahead rapidly to make up for lost time and that, based on the best information we could obtain, the entire issue of biochemistry on the campus should be placed again before the Academic Vice President and his Council of Instruction. And so this was done and Professor Smith was always keenly interested in our progress because of his continuing concern for academic provincialism on the campus. One day shortly before his death it was my good fortune to sit next to him at the end of a Faculty Club lunch table. A group of professors, who were unaware of Professor Smith and myself, were in an animated discussion about some problem in which conservative academic liberalism was the unmistakable tone. Professor Smith with a brightened though saddened expression conveying the idea that this attitude being vociferously expressed by our tablemates was the root of many troubles plaguing the University's growth. He merely said, "Our problem!"

Accompanying the above mentioned report to the Council on Instruction was a series of well documented requests to help the Department achieve the five objectives proposed to the Council (page 95). These requests were:

1. Change the name of the Department of Agricultural Biochemistry to the Department of Biochemistry. This identification would be in keeping with other universities wherein general biochemistry departments were so named, and when medical school biochemistry groups were located on the same campus such medically oriented departments were usually called Departments of

Physiological Chemistry. A change in name would avoid communication problems within the University and with agencies on the outside. This was particularly important because many graduate students came from outside of the University and the University budget was so tight that we, of necessity, had to seek grants from outside in order to support faculty and graduate student research.

2. Permit consolidation of some undergraduate service courses.

3. Permit some minor changes and consolidation in advanced level courses so that there would be a basic three quarter sequence of courses for the advanced undergraduate and graduate students.

4. Permit an undergraduate curriculum which could support graduate work in biochemistry. Although the study of biochemistry itself is essentially a graduate program as is intensive study of any branch of chemistry the curriculum could serve to bring biochemistry to the attention of the undergraduate - something not being done at the time at O.S.U. Furthermore such a curriculum approved by the Academic Vice-President and his appointive Council on Instruction would supercede the restrictions of the 30-rule which had for so many years hampered the Department from properly serving undergraduates interested in biochemistry. Finally such a curriculum, being a broad basic science curriculum, could support graduate work in other areas of chemistry or biology as well as professionally oriented programs such as medicine, dentistry, or veterinary medicine.

The requests to consolidate some undergraduate courses and to revise our advance offerings to give the graduate an intensive three quarter sequence in biochemistry (2 and 3 above) were approved by the Council.

The request of the Department to change its name simply to Department of Biochemistry was not allowed. The College of Arts and Sciences and the Department of Chemistry objected because even though they had no biochemistry they might wish to have some day. Professor Clayton Smith, Chairman of the Department of Physiological Chemistry, Pharmacology and Materia Medica objected because as he stated in a letter to Vice President Frederic Heimberger dated March 2, 1955:

"Departments of Agricultural Chemistry or Agricultural Biochemistry have been established in State Universities and in Agricultural Colleges for the purpose of training students in chemistry as applied to agriculture.

"Likewise, Departments of Physiological Chemistry or Biochemistry have been established in medical schools for the purpose of training students in chemistry as applied to medicine and allied medical sciences."

Such a limited view of the function of these departments was news. The Department of Agricultural (Chemistry) Biochemistry had never operated under such policy nor could it develop a biochemistry program from such a limited base. In subsequent years this was to be the position and contention

of the medical group. Professor Smith however indicated in the letter that Professor J. B. Brown found no objection to the request of our department to change its name. Professor Brown indeed had been appointed a member of the graduate faculty of the Department of Agricultural Biochemistry. He had given helpful cooperation by putting some of his facilities at the disposal of and by his giving helpful advice to Mr. Nurul Absar Khan on his research. Because of Professor Brown's reputation in the chemistry of fats a number of overseas students interested in fats were coming to his laboratory and some of them were well trained in the botanical sciences. Since, however, his own department would not recognize the botanical sciences as legitimate biology in their doctoral programs a few of these students were registered in the Department of Agricultural Biochemistry. Our department had long recognized that doctoral candidates might choose either zoological, botanical or microbiological sciences as their area of competence in biology. However, when Professor Brown succeeded Professor Smith as Chairman of Physiological Chemistry, Pharmacology and Materia Medica in 1957 he assumed the position and point of view of Professor Smith.

The action of the Council of Instruction in refusing once again (previous request was in 1947) to come to grips with the problem of assisting the Department in its growth by properly identifying its function was denied. This action was a great disappointment to the staff of the department because we had not been allowed to even appear or offer rebuttal to those opposing us. Academic administration by veto rather than creative leadership seemed to be the policy of the Council.

Concerning the request for a formalized undergraduate program the Council did approve the program but denied that those taking the curriculum should be granted the B.S. degree. Rather the Council insisted that it be a special degree B.S. in Agricultural Biochemistry. This position preserved the sanctity of the narrow policy that only students registered in the College of Arts and Sciences could get untagged B.S. and B.A. degrees. The College of Arts and Sciences refused to permit the Department's new program to be presented to the great mass of uncommitted students registered in their college and to point out the area of biochemistry to their students. The archaic and provincial point of view of the College of Arts and Science is even more ironic for the type of curriculum proposed by the Department of Agricultural Biochemistry is the program that 10 years later was cited by the leading departments of biochemistry of the country, during a conference sponsored by the National Institutes of Health, as the ideal undergraduate curriculum to support graduate study in biochemistry or other areas of biology or chemistry. The actual program noted in the N.I.H. Conference of 1964 was that of Michigan State University although in 1954 this university did not even have an integrated biochemistry program. The tragedy of all of this maneuvering by the various groups to retard the growth of our total program is that not a single opponent offered to recognize the problems presented by the Department of Agricultural Biochemistry, rather they chose to veto our requests without the slightest

hint of willingness to discuss and try to mutually solve the problem.

The severity of the dichotomy or academic snobbery at the University is given by the following experience. In 1951 a student in the Plant Science curriculum of the College of Agriculture, advised by Professor Burrell, had an outstanding academic record and had accumulated an excessive number of credits to get around the 30 hour rule and still take sufficient basic chemistry, physics and mathematics to go into graduate work in biochemistry. Professor Almy and Associate Professor Deatherage were members of Phi Beta Kappa. Since this student had indeed taken more than enough courses to satisfy Phi Beta Kappa requirements here at OSU or elsewhere, he was nominated for his honor. Even though nothing in the by-laws of Phi Beta Kappa would exclude this nominee, he was rejected because he was registered in the University in a "practical or vocational" area outside the College of Arts and Sciences. Twelve years later we were pleased that, at last, Phi Beta Kappa at OSU could broaden its view. For the first time a student outside the narrow College of Arts and Sciences was elected; he was Kenneth Paul Klatt, Bachelor of Science in Agricultural Biochemistry, 1963. He was nominated by Professor Deatherage and with the support of a number of members of Phi Beta Kappa including the President of the University; the O.S.U. Phi Beta Chapter policy was liberalized beyond the College of Arts and Sciences.

Notwithstanding disappointments of the actions of the Council of Instruction we had made some significant progress in the academic jungle. Within our own Department the graduate program was going well and the Department was receiving additional recognition. Professors A. L. Moxon and Orville Bentley, (Now in 1969 Dean of the College of Agriculture, University of Illinois) of the Department of Animal Science were both Wisconsin trained biochemists. They were appointed to a graduate faculty of the Department and gave a broader base to the nutritional area of our total program. Dr. Eugen Wierbicki who received his Ph.D. in 1953 stayed on full time as a Research Associate to help carry on the meats biochemistry program until he became an American citizen in 1956. He made outstanding progress. One of the young students he nutured was Mr. Ernest Briskey an M.S. student in Animal Science who is now Professor at the University of Wisconsin and recognized for his excellent program in the biochemistry of muscle as meat. A war refugee from Byelorussia, Dr. Wierbicki received his early education in his homeland, took graduate work and a doctorate in Agriculture at the University of Munich in Germany before enrolling as a Graduate Fellow in the Department in 1950. He is now in charge of the Food Irradiation Program for the Department for the Defense, Natick, Massachusetts.

The antibiotics work was carried on for a number of years with the close cooperation of Professor Harry Weiser. A number of his students earned Ph.D. degrees in this cooperative venture. The work on the chemistry of coffee was resumed under a grant of the Coffee Brewing Institute, and the Frasch Foundation's continued support permitted expansion the

the Department's work into the synthesis and degradation of proteins. The Atomic Energy Commission assisted in providing some equipment for teaching purposes. The work of Professor Burrell and Associate Professor Varner in plant metabolism continued and upon his return from California Institute of Technology, Professor Varner expanded his work involving nitrogen metabolism - particularly regarding glutamine synthetase and the role of molybdenum in azotobacter.

Professor Moore was making significant contributions in modernizing our courses in nutrition, intermediary metabolism and enzymes. His research on hormone-enzyme interactions was a very challenging, difficult, and relatively new area but he was attracting students and he was promoted to Associate Professor in 1956.

The Department's responsibilities increased as numbers of students increased and the research program expanded, and so in 1955, it became possible through an increase in the Department's salary budget to add another faculty member. Because of Professor Burrell's intention to retire in the near future it seemed appropriate that the new staff member be in the general field of plant biochemistry. Even though the College of Agriculture and the University increased the salary budget there was still no money for research for any new staff member and his students and the costs of research and of student stipends were rapidly increasing. So in selecting faculty for the growing program in the Department of Agricultural Biochemistry a hitherto unconsidered criterion was forced upon the Department. Is the work of a new faculty member of such stature that he will be able to attract enough money by grants and/or contracts to support his own research and at least part of that of his graduate students? Such a condition for new staff is too restrictive but with university funds unavailable for research no alternative was available in 1955 and it continues to be so in later years.

During Professor Varner's year at California Institute of Technology he became closely associated with another research associate of Professor James Bonner, Dr. George C. Webster. Dr. Webster had his Ph.D. from the University of Minnesota in Plant Physiology and was working for several years with Professor Bonner in the area of protein biosynthesis. Associate Professor Varner felt that Dr. Webster would fill our needs and Professor Bonner was indeed high in praise of Dr. Webster's ability and recommended him without any reservations. The result was that Dr. Webster was offered the vacancy at the rank of Associate Professor. Through the Kettering Foundation some funds were made available for Professor Webster to begin his research program - at first a cooperative venture in glutamine synthetase with Professor Varner, begun at the California Institute of Technology, and later in the area of protein biosynthesis - one of the more glamourous areas of biochemical research at the time.

The Department was most fortunate to secure the services of Mrs. Doris Buchanan as Department Secretary in 1955 and she gave unselfish,

devoted and efficient service until her retirement in April, 1969. Indeed it is difficult to imagine what the Department could have done without her and it is regrettable that more meaningful compensation would not be possible under Civil Service restrictions.

The rapidly expanding grant programs of the National Science Foundation and the National Institutes of Health offered additional opportunities for financial assistance for faculty and student research and for stipends, but University funds for maintenance, student laboratories, laboratory instruction, technical and secretarial assistance were hard to come by.

Rapidly increasing salary scales for professors of biochemistry were beginning to pinch our financial toes a bit more and the Department had to consider ways of stretching salary dollars. The policy that the University salary budget should at least pay faculty salaries had to be stretched a bit. The research programs in the biochemistry of meat and in antibiotics had brought requests for the Department Chairman to do some consulting work in these areas involving research programs in the U.S.A. and other countries. The College of Agriculture, the University and the Ohio Agricultural Experiments Station agreed that this should be done within the time limitation for outside services imposed by the Board of Trustees. In so doing it was possible to use limited University funds for other professors salary adjustments. In many ways this was not desirable but seemed to be the only way to keep up the momentum of our expanding biochemistry program. There was another reason why this was done particularly as regards the antibiotics in food program. Antibiotic feeding in animal production had become commonplace. In our research on the biochemistry of the aging process of meat antibiotics had been effective tools; - the effectiveness in controlling bacteria in meat was greater than anticipated or predictable from bacteriological data acquired in the laboratory and suddenly industrial concerns were interested in promoting antibiotic preservation of foods. The University, the Experiment Station and the Department became automatically involved when the initial findings were reported, and so it was considered that we should continue to follow research and development involving this new concept in food preservation. Cooperating with industry was one way to accomplish this goal. One result in order to guarantee that no single company could use our research for its own individual gain was to patent the process of using antibiotics in meat. This was done and the patent was dedicated to free and public use. The Department policy of paying entire salaries of professors from University salary budget eventually was to fall due to pressure of the policy of the National Institutes of Health, the National Science Foundations and other agencies to allow in their grants salary items for professors (4th quarter salaries, etc.). Indeed in many well known private universities, even the entire salaries "tenured" professors were being covered by grants rather than by university resources.

Further revisions of the Departments course offerings were made. Ever since the arrival of Professor Henry A. Weber, the Department had

taught service courses in organic chemistry and quantitative analysis emphasizing compounds of biological interest. These courses became the most elementary and basic courses of the Department from the time all students in the College of Agriculture were expected to take regular freshman chemistry in the Department of Chemistry before enrolling in courses in the Department of Agricultural Biochemistry. That change was instituted with the arrival of Professor Alfred Vivian and was made possible by the new program in the Department of Chemistry instituted at that time by the young Professor William McPherson and his equally young colleagues. Now in the 1950's there was increasing pressure that we expand our service offerings in biochemistry and it would be possible to do this without increasing staff teaching loads providing students needing some organic chemistry and quantitative analysis would take these in the Department of Chemistry. This would permit the Department to offer a one quarter lower level service course in general biochemistry for the many students wishing only a one quarter survey course and a one quarter course in animal biochemistry for students in veterinary medicine. With such an arrangement the first quarter of the three quarter general biochemistry sequence at the advanced level would not need to serve the survey function for lower level students.

The Department for more than 60 years had taught courses in dairy chemistry and Professors Lyman and Almy and their students had made very significant contributions to the field. The number of students in Dairy Technology was dwindling due to changes in the dairy industry. Furthermore Professor Ira Gould of the Department of Dairy Technology, who had succeeded Professor Robert Stoltz as Chairman of that Department was anxious that his department should be more self contained and preferred that what was taught as Dairy Chemistry by Professor Almy be made a part of Dairy Technology Courses and so the Department of Agricultural Biochemistry courses in dairy chemistry were phased out as Professor Almy approached retirement. However, the need for a general course in the Chemistry of Foods and Food Processing was still necessary to serve other departments interested in various aspects of foods and this course 613 (now 551) by Professor Deatherage served and continues to serve these areas.

The rather rapid evolution of the course offerings in the Department was not without its problems. The field of biochemistry was expanding so rapidly due to the fact that many basic and applied areas of biology were becoming oriented to a more biochemical point of view prompting the new term Molecular Biology. It was indeed difficult to satisfy all the different points of view desired in the service courses or even in the advanced courses. It is almost impossible for a professor of biochemistry to relate his course to all the diverse applications in which his students may be interested. The Department was roundly criticized by the Chairman of the Department of Horticulture because in their biochemistry courses horticulture students might be expected to do experiments involving animal tissue. A Professor of Bacteriology was upset because some of our lectures and laboratories contained exercises involving single cells and our professors had dared suggest for

their classes an auxiliary text in Cell Physiology. Still another criticism came from a colleague in the Department of Chemistry who was becoming increasingly aware of the basic discipline of biochemistry along with others in his department but he did not want his students to take any laboratory work because it took too much time. After all, in his point of view, a chemistry student needed only for a one or two quarter hour lecture course in order to know biochemistry. When detailing some of these criticisms to a colleague his reply was that Department seemed to be going places because no one take a club to knock a bad apple off the tree.

As a result of the antibiotic work Professor Deatherage was asked to participate in a number of conferences and to assist in experiments in other coutries. One such excursion took him around the world and offered an unusual opportunity to lecture in a number of universities in other countries, to visit many former foreign students at their home universities and to become personally acquainted with the leaders in both basic and applied research on the biochemistry, bacteriology and technology of meat, many of whom had already or would visit the Department.

With funds from the Graduate School and other sources the Department was able to institute a program of lectures by the leading biochemists of the country. This enriched the total program greatly and offered both students and faculty the opportunity to become personally acquainted with them and their work.

The Departments' total program appeared to be going well. Almost all, between $80^0/_0$ and $90^0/_0$, of the university salary allocation to the Department was being put into salaries of our professors and the results of the research of our faculty and their students was being recognized and bringing in almost sufficient money to support the research program although there were needs for capital equipment. Also the evolution of the academic program had resulted in a more highly integrated and more purposeful program of courses in biochemistry meeting the needs for students in other areas as well as for biochemistry students themselves. But looking ahead, the Department would have to contend with the never ending problem of getting grants to support its work, expanding faculty and facilities, and attracting qualified students. In this latter connection the war had been over for a decade and the decline in birthrate incident with the war would soon affect the number of potential graduate students with whom we were already having difficulty communicating because we were not being identified correctly. The shift of the population of the country from rural to predominantly urban and the fact that few people, scientists and educators, knew anything about the history of biochemistry, made it difficult to explain to prospective students and often to granting agencies why the Department was known as Agricultural Biochemistry, when other universities with well recognized biochemistry programs were known as Departments of Biochemistry. Our faculty members visited many colleges throughout the state to become more familiar with their programs and to meet their faculties and

students. The reports brought back were always the same-prospective students and college faculties had difficulty understanding our name on the one hand and our program on the other. So in spite of progress in some areas, the Department was sure to face critical times ahead and in order surmount these problems on the horizon the University would have to recognize the handicap being imposed on the Department by insisting on the name Agricultural Biochemistry. The academic administration certainly must know that it is their responsibility to create an atmosphere for growth of departments. Good seeds must have good soil and good climate to produce good crops. Promising scholars, students as well as faculty, need a stimulating academic climate to reach their full potential.

In view of these problems it was decided that the Department might publish an annual report. The report was to give brief summaries of research projects, recognize the sponsors of such projects, list graduate students, note visiting lecturers, etc. Such a report could serve several important functions; to acquaint prospective students with the program of the Department; to do the same for faculties of institutions sending students to us; to inform many faculty members and administrators in our own university about our work; to briefly describe progress on individual research projects; to recognize sponsors of these projects; and to present in concise form the total program of the department to granting agencies and prospective project sponsors.

In order to initiate the reports and give coherence to subsequent reports the first one covered the years 1954-57. The cover of the report showed a picture of Vivian Hall and was simply entitled "Biochemistry. 1954-57. Teaching and Research Programs. Department of Agricultural Biochemistry. The Ohio State University, Columbus, Ohio." The role listed Professors Almy, Deatherage and Burrell, Professor Emeritus Lyman, and Associate Professors Moore, Varner and Webster; Cooperating Faculty, Assistant Dean T.S. Sutton; Professor J.B. Brown, Physiological Chemistry; Professor A.L. Moxon and Associate Professor Orville Bentley, Animal Science; 10 Postdoctoral Fellows, five of which were still in the Department in 1957; and 22 graduate students. After a summary of the teaching program and a few notes on individual faculty activities the following visiting lectures were noted: Dr. Alton Meister, National Cancer Institute; Dr. David E. Green, Enzyme Institute University of Wisconsin; Professor Konrad Block, Harvard University; Professor Bernard Davis, New York University; Professor Arthur Kornberg, Washington University (St. Louis); and Professor Fritz Lipman, Harvard University. For the 1954-57 period 16 Ph.D.'s and 7 M.S. degrees had been earned. The report listed ten projects in enzyme chemistry, two in lipids, nine in protein and nucleic metabolism, five in respiration and phosphorylation; three in metabolism of inorganic ions and eighteen in foods and nutrition. Each project had the names of those persons working on it and that of its sponsor as well as an abstract of work done. A total of 25 agencies had contributed to the research efforts of the department.

Copies of this first report were sent in May 1957 to project sponsors, colleges in the state; prospective students, and to prospective granting agencies with project proposals being initiated by faculty. Also copies were sent to the President, the Vice Presidents, Deans of the Colleges, members of the Advisory Research Council and the Council on Instruction within the University. Many letters of commendation were received from outside and some from inside the University. Research Professor N. Paul Hudson, former Dean of the Graduate School wrote. "the quality is obviously there ...: I am proud to see your program and the quality of your achievements. With congratulations." Dean Everett Walters of the Graduate School wrote, "You are to be congratulated ... I hope this booklet will have wide circulation". Dean Alpheus W. Smith in a letter said, "This is an impressive outline and presentation and ought to produce valuable results not only in bringing prestige to the Department but also in obtaining additional support .... I am of the opinion that your policy in preparing such a brochure from time to time is thoroughly justified and will produce valuable results. I hope that other areas in the University will adopt a similar policy".

The report did indeed prove very helpful in negotiations with granting agencies and in presenting the Department to other colleges and interested groups and to prospective students. For some church related colleges it brought modern biochemistry more realistically to their students. However within the university the report was not too well received in some sectors.

On May 2, 1957 Vice President Frederick Heimberger wrote to Assistant Dean John Mount of the College of Agriculture that the Council of Instruction had not approved the Departments request to be known as the Department of Biochemistry without any reference to the documents furnished in support of the request at that time or in previous years. He further stated that the Council had approved the other minor requests concerning courses and the material for the Bulletin to be published shortly. When the official bulletins of the Colleges of the University appeared, it was discovered that all the bulletin material had been altered by the Council of Instruction without consulting the Department so that everywhere the word "biochemistry" appeared in the titles and description of the Department's courses and programs appeared the word "agricultural" had been inserted in order to change the meaning entirely. In that context common usage had reached the point in the scientific community to where "agricultural" denoted the chemistry of fertilizers, soil conditioners, herbicides, insecticides etc. and not basic biochemistry. Indeed this point was clear to the Council from documents submitted to them. So the official bulletins of the University at least for the next year would negate the effect of the department's report.

In 1956 President Howard L. Bevis retired and he was succeeded by Dr. Novice G. Fawcett a graduate in physics of Kenyon College who went into public school work and took graduate work in Education at the University. It was natural that the Board of Trustees seriously consider him because in

nine years he had turned the Columbus Public School system from an acutely overcrowded, archaic condition to a properly staffed, progressive system with a program and plan established to meet the impending public school crisis occasioned by the post war baby bulge. President Fawcett was confronted with many problems when he took over leadership of the University and again the most crucial were those of funding, shortage of space and essentially no long range plan of the University to meet its obligation to the increasing university population coming in the years immediately ahead.

In subsequent years President Fawcett became aware that the Department of Agricultural Biochemistry was at the focal point of academic bureaucracy but even though sympathetic to many of our needs, he could not, of course, dictate change. But immediately after he took office there were some changes made, particularly in the area of fiscal management, which were helpful to the Department. Heretofore financial matters were controlled almost completely by the Business office and the common practice had been to send in requisitions and hope they would be honored. President Fawcett instituted a system whereby each department had equipment, supplies, maintenance and travel budgets as well as salary accounts. Of course when this system started, the grandfather clause, so to speak, protected those departments of the University that had been given long time preferential treatment, but, in time, adjustments were made so as to assure more equitable distribution of available funds. Now for the first time, with their own allotments for the various categories of expenditures, the departments of the University could plan ahead and make more efficient use of monies designated to them.

Professor Robin Charles Burrell completed his long career at the University and retired in 1958. During his tenure in the Department he had taught the key course upon which all advanced courses depended - General Biological Chemistry, 601. In addition he had carried the teaching load for all students interested in plant biochemistry. Professor Burrell was an abstractor for Chemical abstracts for more than twenty five years. He and Mrs. Burrell, childless, opened their home to students. The Burrells loved good music, art and literature, and with Professor Burrell's love for plants manifest in extensive gardens, it is little wonder that those visiting their home found cultural stimulation intermingled with warm personal interest in students' welfare. Students in the Department were always attracted by his bulletin board. Sometimes there were significant quotations of famous authors often by Goethe who was Dr. Burrell's favorite writer; at other times he took note of significant scientific events. Shortly after his retirement his vision failed to a large degree but he carried on and later Mrs. Burrell was stricken by Parkinson's disease, Dr. Burrell kept up his bulletin board in the Department until he died in 1966, Mrs. Burrell passed away in 1968.

To fill the vacancy on the staff created by Professor Burrell's retirement, Dr. John E. Gander was hired as Assistant Professor. He had earned

his Ph.D. at the University of Minnesota and had returned to his native Montana as Assistant Professor of Chemistry for three years before joining our group. His interests were in enzymology and in the biosynthesis of cyanogenic glycosides. At this time also Associate Professor Joseph E. Varner was promoted to Professor.

The Department's research program continued to grow. Postdoctoral fellows helped it along greatly, but because graduate student numbers were decreasing, it was necessary to retain more technical assistants. The problem of communicating with prospective American graduate students continued and six of 17 graduate students in 1957-58 were foreign. The Council on Instruction had changed the University Bulletins without consulting the Department, the library turned down our library requests because they represented basic science and not agricultural applications, and problems with the Entrance Board continued because some workers in that office thought that the University had no biochemistry program. So again the Department petitioned the Council on Instruction to permit the Department to be known as simply the Department of Biochemistry since no confusion would result with the College of Medicine as that department was known as Physiological Chemistry, Pharmacology and Materia Medica. The Department's petition was extensively documented. It showed that of 90 journal articles originating from the Department in 1954-57 none were in the area of the field known by the scientific community as agricultural as noted by the table contents of the Journal of Agricultural and Food Chemistry; that in 24 leading universities (14 Land Grant) their biochemistry departments were not noted as agricultural even though their biochemistry departments were often budgeted in colleges of agriculture; that of these institutions the Ohio State University ranked at the bottom in invitational membership in the American Society of Biological Chemistry; that more biochemistry papers were given at American Chemical Society meetings than in any other branch of chemistry; and that it was necessary to get outside funds to carry on the Department's program; and that granting agencies were openly questioning the Department on its name and further questioning the University's academic policy and educational goals in general.

Before going ahead we had a number of conferences with Professor J.B. Brown who had replaced Professor Clayton Smith as Chairman of the Department of Physiological Chemistry and Pharmacology of the College of Medicine. It had been inferred to the Department that upon the change in chairmanship of that department, the Council in Instruction would move ahead on the "biochemistry problem". Professor Brown was reluctant to cooperate with us in developing a common basic general graduate biochemistry courses and program even though it would have meant better use of limited faculty manpower for both groups. Professor Brown felt that his department's mission was to teach medical students and that ours should be to teach agricultural students. We went ahead with the petition with support, as always, of the College of Agriculture. In a letter to Professor Brown dated November 14, 1957 and with copies to the Council on Instruction, the Department's position was made clear:

"Dear J.B.:

This letter will serve to confirm our conversation, in which Associate Dean T.S. Sutton took part, concerning the request of this department to change its name to the Department of Biochemistry, or perhaps to the Department of Biological Chemistry or the Department of General Biochemistry.

After considerable thought, we are requesting again this year that the Council of Instruction approve our petition to change the name of this department. Although we prefer the name Department of Biochemistry, two other alternatives are suggested. There is no need to repeat here the many reasons for this request since you were a member of the Council on Instruction in 1954 when we filed a request to change the department's name and have seen the subsequent arguments presented to the Council on this matter. Additional documents will be presented shortly to the Council.

I wish to assure you that we do appreciate your position. Let me say again that we do not aspire to a name which will preclude proper development of your own department. There is much precedent for a Department of Physiological Chemistry and a Department of Biochemistry on the same campus (e.g. University of Wisconsin). However, if our name is changed to the Department of Biochemistry and you and your group should wish to change your name at some later date even to the Department of Biochemistry, we would have no objection if on the graduate level common course offerings, common graduate requirements, and common standards of research could be agreed upon. As I have mentioned to you from time to time over the past several years, I see no reason why biochemistry at the graduate level could not have a unit approach at the Ohio State University. Certainly your own participation in the graduate activities of this department supports this view. I do appreciate that the service teaching and budgeting of the two departments may have less common ground. Even so, it is the hope of our entire staff that closer cooperation on the graduate level may be affected for the benefit of both departments, of the graduate students, and of the University itself. It is in this spirit that we have requested a change in name and we would hope to have your cooperation in this matter. I am certain that both departments would benefit in the long run.

Sincerely yours,

F.E. Deatherage

cc Dr. T. S. Sutton"

The Council on Instruction turned down the Department's request but on May 2, 1958, Vice President for Instruction and Research Frederic Heimberger did call a meeting of Professor Brown, Professor Harvey Moyer, Chairman of the Department of Chemistry and Professor Deatherage to a meeting to discuss the "biochemistry problem". There were no representatives of the administrations of the Colleges of Agriculture, Arts and Sciences, or Medicine at the meeting. Professor Moyer indicated without specific suggestions that the Department of Chemistry would like a Division of Biochemistry so that they would have a self contained unit rather than send students to other department's to study biochemistry even though both biochemistry groups had long sent them students to take advanced organic and physical chemistry in the Department of Chemistry. Professor Brown reiterated his position that their mission was primarily teaching medical students and that our mission was to teach agricultural students. At that meeting the Department of Agricultural Biochemistry made specific proposals for interdepartmental cooperation which were outlined in a letter to Professor Brown and Vice President Heimberger.

"Dear J. B.:

In view of our conversations with Vice President Heimberger and Professor Moyer on May 2, I would like to reaffirm our position and reiterate my proposal of May 2 which has the unanimous support of our faculty.

Our position is based on the premises that a university is a community of scholars; that a university is the training ground for scholars; that a university has an obligation to offer the broadest possible intellectual opportunities to all students -- undergraduate and graduate -- with a minimum number of barriers.

We propose:

1. That the Department of Physiological Chemistry agree to the change in the name of our department to the Department of Biochemistry or Department of General Biochemistry and thus make plainly clear to all students and faculty the function of the biochemistry department which is budgeted in the College of Agriculture.

2. That the Department of Physiological Chemistry, the Department of (Agricultural) Biochemistry and the administrations of the Colleges of Agriculture, Arts and Medicine agree on broad and basic educational standards and programs at the undergraduate and graduate levels so that all students interested in biochemistry are presented with a common educational objective.

3. That all applications for admission to the Graduate School in biochemistry be handled by a common committee of our two departments.

4. That applications for assistantships and fellowships be handled as in 3 above.

5. That all undergraduate and graduate students meet common standards for degrees.

6. That all graduate students be given an orientation program into biochemistry at The Ohio State University.

7. That all graduate students in biochemistry be allowed free choice of preceptors and research fields insofar as funds and professorial staff permit.

8. That announcements of graduate opportunities indicate that the Department of Physiological Chemistry and the Department of Biochemistry offer a unified and broad program in biochemistry.

9. That the Department of Physiological Chemistry be included in the annual brochure of our group as a separate unit if it so desires. It is planned that this brochure will be ready by October 1.

I have attempted to make our position clear in the matter of biochemistry at The Ohio State University. Our goal is to offer to all students interested in biochemistry the best and most complete offerings possible and to bring biochemistry to its proper place at The Ohio State University. You may be assured that we will continue to strive toward this goal without usurping the function of any other department of the University.

Sincerely,

F.E. Deatherage

cc Vice President Heimberger
Dean T.S. Sutton"

Later in May the noted biochemist Hill Professor of Physiological Chemistry Paul Boyer of the University of Minnesota spent sometime on campus studying the biochemistry situation as well as giving some lectures on oxidative phosphorylation in the Department of Agricultural Biochemistry. He had been invited through the newly organized Advisory Council on Research of which Professor Osborn Fuller soon to be Dean of the College of Arts and Science was serving as Secretary. Professor Boyer appeared particularly

qualified because the University of Minnesota was itself having organizational problems not unlike those at OSU. Professor Boyer spent time with various people in administration and presumably filed a report on his findings. Copies of the report were not made available to the Department. Were they favorable to the Department's proposals to the Council on Instruction of 1954 and 1957?

Because there had been at least a little dialogue the issue was brought before the Council again hoping that some leadership would be taken by that all powerful group and that at least the Council itself might grant a hearing and open discussion of the problem. The Council decided to defer action but on November 3, 1959 Vice President Heimberger wrote a lengthy letter to the effect that the Council itself had discussed the problem on October 14 and 19, 1959 and that the Council might grant a hearing but the Council was convinced that little or nothing is to be gained because the Council had already made up its mind. Was such a decision guided by the fundamental question, "What is best for the student?" The letter further inferred that we were responsible for lack of cooperation in reaching a solution to the problem of biochemistry on the campus. The letter also ignored completely our proposals of 1954, reiterated in 1957, to the Council and letters to the Council and to Professor Brown making positive proposals for interdepartmental cooperation in developing a general biochemistry program by saying that the Department of Agricultural Biochemistry had only requested a name change and this would do no good except build resentment. Academic administration by veto was still the policy. Rivalries of the Colleges of Medicine and of Arts and Sciences against the College of Agriculture prevailed. But unofficially it was inferred by representatives of the Council that the Department's request would be more favorably received if we would take the initiative and ask to leave the College of Agriculture for the College of Arts and Sciences. To have even made such an inference is an admission of limited academic vision, of not serving the whole University with impartiality, and not basing their decisions on what is best for the students. Other implications were made that the University should reorganize to form a super College of Arts and Sciences with subordinate colleges to serve such applied areas as engineering, agriculture, education, commerce, etc.

The Council on Instruction had been under severe faculty criticism for some time because of its limited perspective and seemingly arbitrary decisions; and, in the fall of 1957, the Faculty Council voted to put an academic officer from each of the five basic undergraduate colleges on the Council of Instruction for a year's trial to see if the conservative academic liberalism might be liberalized. There was a feeling by many that this move had had a tempering and broadening effect on the activities of the Council on Instruction and the Faculty Council in its October 1958 meeting discussed the new make up of the Council on Instruction favorably and instructed the Rules Committee to prepare a rule implementing the desired change so that the new make up of the Council of Instruction should become permanent. Faculty

rules required that any proposed new rule be published in the Lantern on three separate days prior to final action by the Faculty Council. Accordingly the three notices of the proposed new rule finalizing the new make up of the Council on Instruction appeared in the Lantern the week preceding the November 18, 1958 meeting of the Faculty Council. However on Monday, November 17, another rule notice appeared to the effect that the temporary action of the previous year not be made permanent but that the Council on Instruction should not be liberalized by having undergraduate college academic representation. On Tuesday the 18th this same notice which in effect negated the consensus of the October, 1958 meeting of the Faculty Council appeared in the Lantern and that afternoon the Faculty Council with a number of members not present voted to approve the rule reestablishing the old appointive make up of the Council on Instruction even though the third and presumably final notice of the rule change did not appear in the Lantern until Wednesday Nov. 19, after the Faculty Council meeting. The vote, though illegal, rescinded the intent of the October Faculty Council meeting and was allowed to stand because the maneuver was so sudden that its legality was not challenged. At the Faculty Club the next day one official interested in not having the Council of Instruction expanded chortled that Coach "Woody" (Woodrow) Hayes of the football team might take lessons on how to end play the University Faculty. Indeed this same official soon led a group of faculty members to campaign and successfully block one of Ohio State's Championship football teams representing the Big Ten conference in the annual Rose Bowl game as if such a move would cleanse the university and make it "liberal". When one of the absentees for the Council vote, a very popular and honored professor, was questioned about his default, this professor simply replied that the October meeting set the pattern and so there was no need to go to the November meeting because he often found meetings of the Faculty Council boring.

The school year 1958-59 brought to the Department two new faculty members as Assistant Professors. One was Dr. Robert Bernlohr, a graduate of Capital University who had earned his Ph.D. in this Department and for two years was a Research Associate of the Division of Biology of the Oak Ridge National Laboratory. The other was Dr. Palmer Rogers, Jr., a graduate of Yale who took his Ph.D. at Johns Hopkins and also served two years as a Research Associate at Oak Ridge. Both of these promising men added breadth to the total program of the department, particularly in the area of intermediary metabolism of microorganisms, biochemistry of sporulation, and enzyme repression. Now the Department had active programs involving biochemical research in higher plants, higher animals and microorganisms as well as the biochemistry of food and nutrition.

The progress of the Department continued to be summarized annually in reports patterned after the 1954-57 edition. The reports 1957-58 and 1958-59 were well received and the Department was commended for its work. Following the 1958-59 edition there seemed to have been some objection in some quarters for the Department was criticized as being unethical in the President's

Cabinet because the reports did not include the Department of Physiological Chemistry and Pharmacology. The Department had, in fact, on several occasions solicited the cooperation of that Department in a joint venture but the offer was declined. As a result President Fawcett sent a memorandum to all departments encouraging them, in so far as possible, to publish annual reports or brochures of their activities. The memorandum asked that such reports be cleared with the Office of University Relations. So, when it came time to publish the 1959-60 edition the necessary approval was sought and quickly granted, but it was suggested that, for the record, it would be advisable in order to avoid additional adverse reaction in some administrative offices to get the approval of Professor J. B. Brown prior to publishing the 1959-60 report of the Department of Agricultural Biochemistry. This was done. Professor Brown in a letter dated September 27, 1960 rightfully resented that the Department of Agricultural Biochemistry had been requested to get permission of the Department of Physiological Chemistry and Pharmacology in order to publish its report. In this letter Professor Brown acknowledged that on several occasions the Department of Agricultural Biochemistry had asked their cooperation in a joint reporting venture. The 1959-60 report was published and it too was generally well received by many in the university and others on the outside but the internal opposition did not subside and so publication of the annual reports was suspended in the hopes that cooperation among the departments involved, the Vice President for Instruction and Research, the Council of Instruction, and the Advisary Research Council might be stimulated to solve the "biochemistry problem" on the campus.

1959 brought about a revitalization of the University's Institute of Nutrition and Food Technology, which had been organized in 1946 and had through the years functioned with modest support of the Development Fund. Professor T.S. Sutton had been director until 1950 when he became Assistant Dean at which time Professor J. B. Brown became Director. Up to this time the Institute had very limited resources and its needs and those of its constituent departments had changed markedly in its 13 years of existance. Some departments wanted a laboratory for service work, others simply wanted research space and equipment, and still others had already acquired facilities they had hoped to have obtained through the Institute in earlier years. All Institutes of the University had been put under the jurisdiction of the Vice President for Instruction and for Research. It was decided that the Institute should be assigned space in the University Research Center and a full time Director of Laboratories should be retained who was interested in nutrition and, as soon as possible thereafter as funds would permit, a full time Assistant Director of Laboratories in the area of Food Science and Technology would be added. Accordingly Dr. Ralph M. Johnson, Jr. was retained as Director of Laboratories and Assistant Director of the Institute of Nutrition and Food Technology in 1959. (A few years later Dr. Robert Clements, a 1955 Ph.D. from the Department of Agricultural Biochemistry and Research Assistant Professor at the University of California at Riverside was added to the Institute.) Dr. Johnson was a graduate of Utah State College of Agriculture in 1940 and obtained his Ph.D. degree from the Depart-

ment of Biochemistry at the University of Wisconsin in 1948. From then until he came to the Ohio State University he was a Research Associate in Medicine at Henry Ford Hospital, Detroit, Michigan with a joint appointment as Assistant Professor of Physiological Chemistry at Wayne State University.

At about this time two incidents within the department indicated that in our own group there was a certain restiveness which portrayed some rather limited attitudes and views among some of our own staff of what a comprehensive biochemistry department should be and whom should be served by it. Two or three faculty members felt that food biochemistry and nutrition should not be a part of the department's program. One incident was that Professor Almy, an excellent writer and editor, had accepted responsibility for preparing the department's annual report. When it appeared he had arranged research reports in alphabetical order according to professors and such arrangement put the projects on biochemistry of muscle as meat and a cooperative project with the Departments of Animal Science and Bacteriology near the front and the projects of a certain professor near the end of the research reports. This professor disturbed the Chairman of the Department when the professor said that his work should have been first because it was Biochemistry and that the research reports appearing first should really not be in a department of biochemistry. The other incident was that another professor, unauthorized to do so indicated to the Director of the Institute of Nutrition and Food Technology, Professor J.B. Brown, that the program of the Institute would not be of any help to the Department of Agricultural Biochemistry and for that reason the Department saw no reason to extend a courtesy appointment as Professor to the Director of the new Institute laboratories, Dr. Johnson. So it became too clear, what many professors do not like to admit, that intellectual snobbery and a limited or narrow educational philosophy is common and not restricted to any group and could pop out in our own group. It is true, however, that many in the Department had difficulty reconciling the fact that on one hand the Vice President for Instruction and Research could find money to set up another biochemically oriented nonteaching group directly responsible to him, and on the other hand, he could block so many attempts the Department had made to move ahead toward an integrated biochemistry program, while at the same time the professors of this Department had to go on the outside the University to get grants to support their own research and that of their students. Notwithstanding these unfortunate incidents a number of important recognitions came to the Department and its staff in 1959.

The Department desired to make application for a National Institutes of Health Training Grant in Biochemistry. Although many universities had received such grants, not only in biochemistry but in other areas such as physiology, pathology, etc., the Ohio State had no such programs in any area. Toward the preparation of our requests it became clear that we should know more about how other institutions with training grants finance their total efforts. Dean L. L. Rummell, who all through his tenure was

interested in upgrading departmental programs in the College, authorized a special travel grant to the Department Chairman to visit the biochemistry departments at the Universities of Michigan, Wisconsin and Minnesota and Michigan State University to study first hand their teaching and research programs and their financing by university appropriations, by their agricultural experiment stations and by outside grants. The University of Michigan was picked because, although not being a Land Grant University, it did have a Department of Biochemistry which, although budgeted in a medical school, had a long tradition of effectively serving all of the biochemical needs of the university at all levels. from freshman who took only one course in chemistry in their career (and that was from the Department of Biochemistry) to Ph. D. students. Michigan State University, starting almost from scratch later than we had, had vigorously expanded their biochemistry offerings and were building new facilities to serve every need of that expanding university. Furthermore this expansion was done in the administrative framework of the College of Agriculture. The situations at Minnesota and Wisconsin were administratively similar at OSU. These four institutions had training grants from N.I.H. Michigan State's new biochemistry building was being built with generous support from N.I.H. Research support by experiment station funds had been a tradition at Wisconsin and Minnesota from the very beginning of the Hatch Act (federal support for research in agricultural experiment stations). Indeed at these universities the eminence of their biochemistry program was due in a large measure to this support even though, in later years, outside grants were becoming more important in their total financial picture. The findings of these visits were of course shared with the College of Agriculture, the Ohio Agricultural Experiment Station and the central University administration.

The Department prepared a request to the National Institutes of Health for general support of its program through a training grant which included funds for research support, for stipends for graduate students, for some instruction equipment, and for minor items such as honoraria for visiting lecturers. As is costumary in such proposals a committee was sent to the campus to study the Department's proposal, to evaluate the Department itself and to determine the administrative set up of the university as to whether it was conducive to further growth in biochemistry. The committee consisted of Professor Albert Lehninger, Chairman of the Department of Physiological Chemistry, Johns Hopkins University Medical School; Professor G.W. Schwert, Professor of Biochemistry, Duke University; and Professor Herbert Carter, Chairman, Department of Chemistry, University of Illinois. The committee reported favorably on our staff, on our teaching program, and on our research program. They showed concern, however, for the lack of support that the department had received from the central academic administration and that we were trying to build a general biochemistry program under a departmental name which was misleading and had fallen into general disuse. They forecast increasing trouble and indicated that, if the grant were to be approved, there was great uncertainly about its renewal unless the intramural problems were corrected. They further expressed doubt

that the Department could effectively use all it had requested under the situation present in the University at the time. The training grant was approved but with a considerably reduced level of support and was to run from 1960 to 1965. This training grant was the first such grant ever received at the Ohio State University.

The teaching and research of himself and of his students merited recognition for Associate Professor Richard Owen Moore and he was promoted to Professor.

Professor Deatherage was appointed the representative for the American Society of Biological Chemists to the Division of Biology and Agriculture of the National Academy of Sciences - National Research Council. This offered an excellent opportunity to learn of some of the major educational and research problems in these areas throughout the country.

The Department was most fortunate in having two of its Professors recognized by receiving grants to support a years study and research at other universities. Both covered the academic year 1959-60. The University itself had no (and still does not have) sabbatical program but these grants served the same purpose. Professor Richard O. Moore received a grant directly from Harvard University to study and work with Professor Eric Ball, Chairman of the Department of Biological Chemistry. Professor Joseph E. Varner received a Senior Faculty Fellowship of the National Science Foundation permitting him to work with Professor Malcolm Dixon, highly esteemed enzymologist at Cambridge University in England. With two senior staff members away for a year the rest of the faculty were pleased to share a little more extra work so that the Department's activities would continue without interruption.

Professor Deatherage was selected by the U.S. Department of State to be on a seven member team representing the food industry, the U.S. Department of Agriculture and the universities to study education, research, and agricultural and industrial development relating to the food industry of the Union of Soviet Socialist Republics. This study group or team on food science and technology was part of the U.S.A. - U.S.S.R. cultural and scientific exchange program. A further recognition of the Department and one of its alumni was that Dr. Eugen Wierbicki, Ph.D. 1953, and Research Associate 1953-56 in the Department, was an industry representative in the group representing the Rath Packing Company. It is fair to say that Dr. Wierbicki, a native of Byelorussia and in his own right a highly recognized food scientist, was a key member of the team because Russian is his native language, because he is knowledgeable in the ways of dealing with the Russian officials and people, and because he knew by reading original literature the work of many Russian scientists. Certainly without him the mission would not have been half as successful as it was.

1960 was the year of Professor Emory F. Almy's retirement. He had

given 41 years of completely unselfish service to the Department, the University and its students Their home at 2630 Tremont was one of those early homes built in, what was called at one time in the early depression days a realtor's white elephant sold to university professors, Upper Arlington. The Almys were always at home to students and entertained many and rescued some during economic difficulties by sharing their home with students. They were great lovers of music, and Mrs. Almy, an accomplished pianist, was a featured artist in the early days of radio station W.O.S.U. and is still active in music circles today. Professor Almy had in his classes at one time or another most of the students enrolled in the College of Agriculture. He was an excellent researcher but as a teacher he excelled. A little story might illustrate what many students felt about him.

During an illness a few years before his retirement Professor Almy was confined to University Hospital. I was purchasing some flowers to send to him but was concerned at the rather poor selection of flowers in the shop. The manager said that perhaps he could do better and I reluctantly said "OK". When he made out the order and I said that the flowers were for Professor Emory F. Almy, University Hospital, the manager looked up and simply said "Why Dr. Almy was the best teacher I ever had and you can be sure that he will have the best arrangement I can make". The manager kept his word and generously so. Professor Almy's health failed after his retirement and he passed away in 1964.

Dean Leo L. Rummell retired effective January 1, 1960. He had shown outstanding leadership and led the College of Agriculture and the Ohio Agricultural Experiment Station to new heights of recognition throughout the State of Ohio and the nation. He had worked hard to bring the two institutions together into a unified program. He had unusual insight as to how to effectively protect, nurture and support enterprising professors while at the same time keeping an equilibrium in the intramural academic bureaucracy and a respected leadership in dealing with extramural political forces in the State and with pressures of vested interest groups in agriculture. Dean Rummell had indeed been a friend and supporter of the Department and all of its activities, the Department and College could ill afford such loss of leadership at this crucial time.

VIII REORGANIZATION

"Reorganization means disorganization and disorganization means cessation of growth if not life itself" - W.I. Chamberlain, President of Iowa State College to the people and the legislature of the State of Ohio with reference to the Ohio State University, May 21, 1887. (See page 34.)

Dr. Roy M. Kottman succeeded Dean Leo L. Rummell as Dean of the College of Agriculture and Director of the Ohio Agricultural Experiment Station. Dean Kottman, a native of Iowa, received his B.S. from Iowa State College in 1941, served in the U.S. Army 1941-46 and continues to be active in the Reserve; earned an M.S. from the University of Wisconsin, in 1947 and immediately returned to Iowa where he received in 1952 his Ph.D. in Animal Husbandry. After serving on the staff of the Animal Husbandry Department at Iowa State College until 1958, he went to the University of West Virginia as Dean of the College of Agriculture, Forestry and Home Economics. He took up his duties in Columbus July 1, 1960 and the style of leadership for the College of Agriculture and Home Economics and the Ohio Agricultureal Experiment Station changed markedly.

That summer the Department was in its second of two annual programs of research experience for small college professors. This undertaking sponsored by the National Science Foundation was successful in bringing research experience in biochemistry to professors teaching in colleges where there is little opportunity for research and where little biochemistry is taught. This N.S.F. project brought the Department's program to the attention of the colleges which sent their students to the larger universities for graduate study and it also provided excellent experience for our young staff in understanding the problems of the smaller liberal arts church-related colleges.

During Dean and Director Rummell's tenure the idea of expanding the program of the Department of Agricultural Biochemistry more directly into the Ohio Agricultural Experiment Station at Wooster had been discussed on occasion. From 1948 Professor Deatherage had had a small part time appointment in the Department of Animal Science at the OAES. Some departments at Wooster had looked upon a possible Department of Agricultural Biochemistry as an analytical service group. Other departments were reluctant to encourage such a new department since they already had some biochemically oriented staff members and felt a new department might be competitive and dilute resources of the Station; and still other departments were anxious to have a dynamic modern biochemistry group at Wooster. Because of the diversity of feelings among the departments at Wooster on the matter and because of limited resources and space, nothing was done officially to establish a Department of Agricultural Biochemistry at Experiment Station.

A few months after Dean Kottman took office, he telephoned Professor Deatherage at his home on the eve of a meeting of the Board of Trustees of the University and the Board of Control of the Station. (With a single exception

the boards were identical in membership). Dean Kottman indicated that the next day he wanted to present to the joint Boards a proposal to establish a Department of Agricultural Biochemistry at Wooster. He was told by Professor Deatherage that he felt that Department saw no real objection to the move if the new extension of the Department to Wooster would be welcomed by the other departments there and if space and funds could be provided for a full time resident staff at Wooster to complement the activities of the Department in Columbus. It was further noted at the time that unless funds and space were available for a staff of several full time people in the immediate few years ahead, a viable Department at Wooster would probably not become a reality because qualified scientists require at least a small community of workers within their discipline. Dean Kottman indicated that upon approval of the Board of Control of the Ohio Agricultural Experiments Station the Department of Agricultural Biochemistry would be effective in the 1961-62 fiscal year. It appeared that the activities and program of the Department would be extended further and would operate in parallel with other departments at Columbus and at Wooster. So for the first time since Professor Henry A. Weber was Station Chemist in the beginning days, the Department was to be operative at the Station.

The other staff members of the Department heard about the new Department of Agricultural Biochemistry at Wooster in the newspapers and on the radio the next day even before anyone had time to discuss it with the staff. Two faculty members, particularly, expressed strong opposition to this move without prior consultation of the whole department. Of course, it would have been proper to have been able to do so but there had been no time for even informal discussion, let alone a staff meeting. After learning the details and the ideas of Dean Kottman and understanding how some biochemistry departments had been strongly supported by the experiment stations in other universities, further opposition subsided. Yet, some felt that such a quick and impetuous move by Dean and Director Kottman might aggravate problems already confronting the Department in the University itself. The bugaboo of "two cultures" basic and applied still could not be shaken completely from the attitudes of some members within the Department - nor from the attitudes of many members of the entire university faculty and administration for that matter.

As it developed no money was made available to do anything at Wooster until the 1961-62 fiscal year anyway, so the reasoning behind Dean Kottman's rapid move was unclear. It was felt that the first new staff member at Wooster should be in the area of plant metabolism and good candidates in this area were scarce. No one was found that year and not until 1963 was the Department actually started at the Station when Dr. Donald Keirs Dougall was appointed Assistant Professor. Dr. Dougall came from a position of Lecturer in Biochemistry at University of Sydney, Australia. He had earned his bachelor's and master's degrees at the University of Western Australia and his Ph. D. at Oxford. He had been a postdoctoral fellow with Professor Robert Burris at the University of Wisconsin. Dr. Dougall's especial field of interest was nitrogen metabolism in plants using tissue culture techniques.

The Station was able to provide Dr. Dougall with space through the cooperation of the Department of Forestry located in new Williams Hall and some funds for equipment. In 1964 he was able to attract additional support of his research from the Atomic Energy Commission.

Concident with Dean Kottman's proposal to establish a Department of Agricultural Biochemistry Department at Wooster, Professors Richard O. Moore and Joseph E. Varner returned to their posts from their years work at Harvard and Cambridge respectively. The Department was at full strength again - Professors Deatherage, Moore, Varner, and Webster and Assistant Professors Bernlohr, Gander, and Rogers. However, not all was well. For some time, clouds had begun to appear around Professor Webster and his work and it had been indicated to him informally that it might be to his advantage to try another locale for his particular talents. As these clouds thickened further, the opportunity was given to him to devote his entire efforts to the research problems confronting him and no teaching duties were assigned to Professor Webster for the 1960-1961 academic year. At the close of that year he left the university. This very unfortunate situation, of course, was upsetting to the entire department and the discommotion was intensified by Professor Varner's decision to leave the department at the same time.

Conversations were continued all through 1960 in order to explore the many possibilities for a cooperative solution to the biochemistry problem at the University. Professor Grant L. Stahly, Department of Bacteriology and Professor Robert Oetjen, Department of Physics, had joined the administration of the College of Arts and Sciences, both had been cooperative and helpful in some of the Department's activities and Professor Alfred B. Garrett had also become Chairman of the Department of Chemistry. In 1957 Dr. Robert Abeles, a promising young biochemist had been added to the staff of the Department of Chemistry as Assistant Professor. He was, of course, confronted in his own professional development with the organizational handicaps imposed by the University to all young professors of biochemistry.

In order to overcome some objections of distance between biochemistry groups, Professor Garrett agreed to our suggestion that for the academic year 1961-62 the major general biochemistry sequence be given in the new Evans Chemistry Laboratory. Only the lecture parts could be given there because proper facilities for biochemistry laboratory classes were not available in Evans Laboratory. In a meeting on December 9, 1960 we explored other matters of mutual concern also and these are described in the following letter dated December 12, 1960.

December 12, 1960

Professor A.R. Garrett
Chairman
Department of Chemistry
Evans Laboratory
Campus

Dear Al:

In view of our conversation on Friday, December 9, I thought it might be advisable to jot down some thoughts as a basis upon which we might project our collective thinking.

It appears to me that both of us certainly agree that some means should be found whereby biochemistry should serve a more central role in the University educational program. Further, we both recognize that biochemistry is playing an increasingly important role in the various branches of chemistry and of biology. The questions appear to be as to just how, within the University framework, we can bring this about.

As I indicated to you, the Department of Agricultural Biochemistry would hope that more departments in the University would have faculty members within the general discipline of biochemistry. We need more, not less, and we would encourage the Department of Chemistry to have staff members within this discipline. By the same token we wish other departments would do the same.

Next, it seems to me that we should make every effort to see that when new staff members are added, the entire horizon of biochemistry on the University campus should expand. New staff should not be added to duplicate present efforts and programs.

Biochemistry is essentially a graduate discipline and an experimental science. To be effective graduate faculty must do some teaching and have a dynamic research program within which their graduate students may work.

Inasmuch as the Department of Agricultural Biochemistry has teaching and research programs in general biochemistry which are being well received by the professional scientists and educators in the field, we would hope that your new staff could supplement this program.

I would propose for your faculty additions in the area of biochemistry that they teach an advanced seminar in their area of competency and that they share our total effort in teaching general biochemistry. This would mean that perhaps they share with us in the teaching of the basic year's sequence in general biochemistry.

I believe you will agree that an effective graduate program depends on good undergraduate preparation for the students. This means faculty responsibility in advising undergraduate students in their selection of courses even though biochemistry must wait until the senior or graduate years. Graduate students usually enter the field from the biological area or chemical area. As undergraduates majoring in one area are usually deficient in the other area as they embark on a graduate program in biochemistry, we believe that our undergraduate program is very effective and that we should be permitted to offer it on a University-wide basis. The program is a fundamental program and should be offered to students in the College of Arts and Sciences as well as in the College of Agriculture and Home Economics. There is ample evidence to support the view that students are rapidly realizing the role of biochemistry in present day scientific developments and we should make them aware of how to get into the field and the possibilities it offers.

I believe we can agree that in any educational program communication and identification are important. In communicating with small colleges, faculties and students who are unaware of land-grant college organization (and many of these people have relatively little first-hand knowledge of biochemistry and its development) we are handicapped in presenting to them our general biochemistry program at Ohio State University because these people attach improper significance to the name of our department. At the same time our function is misunderstood by many here at the University. Furthermore our name is a handicap in getting outside support which is an absolute essential to an effective graduate program in biochemistry. The name of this department should be simply Department of Biochemistry or Department of General Biochemistry.

If the Department of Chemistry adds faculty in the area of biochemistry and expects to offer the Ph.D. in biochemistry, we would hope that the degree would meet the standards of our own program and that our two departments can present a unified program at the graduate level and at the undergraduate level.

I have attempted to put a few of my thoughts and proposals in writing for study by you and your group. I am sure all want to have this University known as a great scientific center. It can be done within the present framework of the University and we all can appreciate that dedicated cooperation is needed to bring this about.

Sincerely yours,

F. E. Deatherage
Chairman

FED/db

Months later there were no further developments nor was there any reciprocal cooperative move from the College of Arts and Sciences group nor from the College of Medicine group. Assistant Professor Abeles elected to go to the University of Michigan Department of Biochemistry. Agricultural Biochemistry 705, 707, 709, General Biochemistry, basic course for graduate students was given in Evans as planned, but no students from the Department of Chemistry enrolled although total enrollment in this sequence of courses was increasing.

Dr. Junius Fielding Snell joined the staff of the Department as Professor in 1961 with a part-time joint appointment through the Ohio Agricultural Experiment Station. He is from a family of teachers and a brother of Professor Esmond E. Snell of the Department of Biochemistry the University of California at Berkeley. Dr. Snell, a native of Utah and Wyoming, earned his B.S. at the University of Texas in 1943; M.S. in 1945, Ph.D. in 1949 from the University of Wisconsin. He was one of a group of graduate students specializing in the biochemistry of microorganisms and fermentation at Wisconsin who were moved into the fermentation industry during the war emergency to expedite penicillin production. At that time he went temporarily with Charles Pfizer and Co. and returned to that organization upon completion of his doctorate. He was involved early in the use of isotopes in biochemical research and spent considerable time at Oak Ridge in the early 1950's and became Head of the Radiobiochemical Department of his company and Director of the Pfizer Therapeutic Institute. In these responsibilities he was involved in research on antibiotics and in their mode of action and biosynthesis, a field he has continued to develop since coming to the Department. He is currently (1969) Section Editor for Chemical Abstracts, and has made significant contributions to the scientific journals. Also Professor Snell is the author and/or editor of a number of authoritative monographs in the biochemistry of antibiotics.

In early 1962, Dr. Joseph Mendicino joined the Department as Assistant Professor. Dr. Mendicino was a native of Cleveland and received his B.S. degree in 1949 from Case Institute of Technology and his Ph.D. from Western Reserve University in 1953. He stayed at Western Reserve as a Postdoctoral Fellow for a time and then went to study with the eminent Argentinian biochemist Professor Luiz Leloir in Buenos Aires. After two years he returned to Western Reserve as a Research Associate of Professor M.F. Utter.

Research grants were sufficient to guarantee that the research program would continue unabated and the N.I.H. Training Grant brought adequate support for students and University funds brought faculty salaries for the staff to a competitive level. Yet there was a certain restiveness among the young staff members as the 1961-62 school year began. The departments financial picture was brighter than ever but the academic thicket was still as tangled as ever. The number of graduate students had dropped and new qualified graduate students were fewer in spite of adequate funds for stipends. The faculty had extended themselves to build an excellent biochemistry program to serve the University and yet were increasingly concerned that their efforts

were being dulled by academic conservatism, and unwillingness of many in the University to cooperate in solving the problems of biochemistry on the campus. The younger staff members were personally and particularly concerned about trying to develop their careers with restrictions being dictated by reactionary academic administration with limited vision. Seven years had passed since the Department's original proposals for an integrated biochemistry program were made to the Council on Instruction. These were turned down again in 1957 - and in 1959 - now in late 1961 nothing in the way of cooperation had come from the Department's most recent overtures to the College of Arts and Sciences and to others objecting to our requests and proposals-nor were counterproposals coming from any source. So in spite of the Vice President Heimberger's letter of November 3, 1959, that the Council of Instruction was unanimous that no good could come from any personal appearance and further petition by the Department, the entire staff of the Department was itself unamimous that one last concerted attempt should be made to get the Council on Instruction and the Vice President for Instruction and Research to take some leadership in trying to solve the impasse. The Council on Instruction seemed to operate on this and other major academic issues simply by veto and an occasional approval of any matter which came before it. If they vetoed any petition, the Council on Instruction accepted no leadership whatsoever in trying to effect a solution to the petitioner's problem. The Faculty Council itself was becoming concerned about academic stagnation and coincident favoritism by the Council on Instruction in its decisions. At the time the Department was making its final appeal to the Council on Instruction, the Faculty Council Program Committee was receiving many requests that the Faculty Council itself give serious attention to the difficulties surrounding the actions (or inactions) and limited vision and lack of leadership by the Council on Instruction. It will be recalled that the Faculty Council had been outmanouvered in an attempt to liberalize the Council on Instruction just three years before. As a result, the Faculty Council itself established an Ad Hoc Committee with Professor T.J. Jenson as Chairman to study the functioning of the Council on Instruction.

Much work was given to the preparation of a detailed proposal to the Council on Instruction and to submit it together with a request that the Department be permitted to appear to present its case directly to the Council. In order to have a reasonable chance that the Council on Instruction would consider the issue in the 1961-62 academic year, the Department's proposal and petition were filed with the Council in late November 1961. A copy was also sent to President Novice G. Fawcett for his information. Shortly thereafter he wrote to Professor Deatherage that he had given very careful study to the Department's proposal to solve the biochemistry problem and found it very reasonable and that, although he was favorably impressed by the proposal, the implementation of any academic action should properly came from the office of Vice President for Instruction and Research. The Department's hearing was set for December 11, 1961. After being denied even an appearance for seven years, it seemed that perhaps the Council

on Instruction was willing to try to solve the problem.

Dr. Roy M. Kottman wanted personally to make the presentation as Dean and did so with Professor Deatherage assisting him. However, after having spent so much time and study on the whole matter the author must confess that he was not a little bit disturbed that Dean Kottman was unable to find time for us to prepare jointly for this important session that the Department had waited more than seven years to get with the Council on Instruction. In fact, Dean Kottman almost did not arrive for the meeting, and, sensing my anxiety at the lateness of his appearance, assured me that he had never had any trouble with this Council or any other council of its type in selling his point of view and reaching his goal. He was to find soon that he was not in the preferential role that Agriculture has at Iowa or West Virginia. Since all members of the Council had presumably received copies of the proposal prior to the meeting (See Appendix A) the proposal was only read in part at the meeting and some additional comments were made in an attempt to stimulate a question and answer period. But there were a very few minor questions and there the session ended.

It is significant perhaps that during the session no reference was made to the organizational structure of the University which was obviously one of the major underlying difficulties. Often, informally, the Vice President and his assistants had expressed a desire to restructure the University and particularly to remove several departments from the College of Agriculture. Apparently this group felt that to support the Department at this time would weaken their position in their desire to reshuffle the University departments and colleges. Vice President Heimberger had himself served as Dean of the College of Arts and Science and his assistant and Vice Chairman of the Council on Instruction was Dr. Jackson Riddle, a Professor of Bacteriology and a physician. The Medicine vs. Arts and Science vs. Agriculture triangle had often been mentioned informally in discussions with those connected with the Council on Instruction who at times indicated that, if the Department of Agricultural Biochemistry would on its own initiative go to the College of Arts and Science, the problem confronting biochemistry would be solved as if certain colleges in a comprehensive university had anointing powers. Then too, it was well known that the Office of Instruction and Research and the College of Arts and Sciences wanted to form a super College of Arts and Sciences with all of the "basic" or "pure" departments and have minor satellite "vocational" or "professional" colleges. Such a move would, of course, mean a basic change in the University's educational philosophy because at this time only the College of Engineering of the five undergraduate colleges had no "basic" areas. The Colleges of Agriculture, Commerce, and Education all had a balance of "basic" and "applied" departments and the College of Arts and Sciences had its "applied" departments particularly of Journalism and Optometry. The only other acceptable alternative of the super Arts College concept were considered to be a series of "basic" and "applied" colleges. The old dichotomy of the university had tenacious roots.

The Department's proposal was sent by the Council on Instruction to Professor J. B. Brown, Chairman of the Department of Physiological Chemistry and Professor Alfred B. Garrett, Chairman of the Department of Chemistry, who would soon become Vice President for Research and the respective deans of Medicine and Arts and Sciences. Discussions had already been held with Professor Brown in the hopes that some cooperative action might be obtained in order to avoid the necessity of going to the Council on our own rather than jointly and thereby present a united front on the matter of Biochemistry at the University.

Professor J. B. Brown submitted a counter proposal (See appendix A) which included some direct rebuttals on some points to our proposal. The cover letter to the Coundil may be of interest particularly the second paragraph, last sentence. Medical schools had lagged well behind colleges of agriculture in developing educational programs in biochemistry. (See data in Appendix A page A23) (Professor Brown's letter, page 126)

The Department's reaction to Professor Brown's position was given in a letter to Vice President Heimberger dated February 9, 1961. (Letter in full is in Appendix A, page A45). In the letter it was noted that the counterproposal in fact agreed basically with four of the five major points of our original proposal - the lone exception was the request for a change in name to simply Department of Biochemistry even though they acknowledged that one of their staff remarked that "... I agree, also that the name Agricultural Biochemistry is long since outmoded and that we have no business continuing with a department so titled." It was pointed out that Professor Brown's hopes that "the change in name would be defferred" until "general policy and academic reorganization" is established was the same answer that the Department of Agricultural Biochemistry had received from its 1954 request.

Professor Brown had felt that in our proposal we had neglected to summarize and thereby belittle the many excellent activities of his department. Yet, since the Department of Physiological Chemistry had declined to work with the Department of Agricultural Biochemistry on the matter, we felt that our petition and proposal should therefore avoid detailed references to other departments and their programs.

The Department of Chemistry, in response to the Department of Agricultural Biochemistry's proposal, requested that it be permitted to set up a Division of Biochemistry, a third group teaching biochemistry on the campus. However, Dean J. Osborn Fuller of The College of Arts and Science overruled the Chemistry Department's position and formally proposed to the Council on Instruction that that College be permitted to set up a third independent Department of Biochemistry which would be completely separate from the Department of Chemistry. Since the proposal the College of Arts and Sciences submitted by Dean Fuller superceded that of its Department of Chemistry, the Department of Agricultural Biochemistry responded only to Dean Fuller's proposal. Dean Fuller had kindly made his first and only

COPY

THE OHIO STATE UNIVERSITY

Department of
Physiological Chemistry
and Pharmacology
J. B. Brown, Ph.D., Chairman

College of Medicine
1645 Neil Avenue
Columbus 10, Ohio

February 1, 1962

Dr. Frederic Heimberger, Chairman
Council on Instruction
Administration Bldg.
Campus

Dear Dr. Heimberger:

We received your communication enclosing the request of the Department of Agricultural Biochemistry to change its name to "Department of Biochemistry" just before the Christmas holidays. It was shown to members of our department and discussed at our monthly departmental meeting on January 8. It is our interpretation that this request for change in name is actually tied into the remainder of the presentation, the objective of which is to create one department of biochemistry on this campus. The nucleus of this new department is apparently the present staff of Agricultural Biochemistry, and the new department to be continued, as at present, in the College of Agriculture.

Our department finds a great deal of merit in Dr. Deatherage's proposal, insofar as the creation of a single strong department on this campus is highly desirable and should be planned for the future. In this we fully concur. However, when all the facts are considered in relation to the total role and function of biochemistry on this campus, it would appear that the first step should be to establish university policy in this direction. We are submitting, accordingly, a presentation of facts and arguments to point out that the single department of biochemistry would be more advantageously placed in the College of Medicine since the role of biochemistry in the health sciences is even more significant than its important role in agriculture.

The appended report, with sufficient copies for necessary distribution to interested persons, presents data to describe the wide role of biochemistry on the Ohio State University campus. There will be included a rather brief recapitulation of the accomplishments and missions of the Department of Physiological Chemistry over the years, brief replies to some of Dr. Deatherage's statements, and finally suggestions as to the future planning for biochemistry on this campus.

If it seems desirable for me to appear before the Council on Instruction I shall be glad to do so.

Cordially yours,

J. B. Brown, Chairman
Department of Physiological
Chemistry and Pharmacology

JBB:mcs
cc: Dean Meiling
Dean Prior
Dr. Riddle

visit to the Department of Agricultural Biochemistry for a discussion of his proposal, - a draft of which he left for our study. (See appendix A page A48).

In our conversation with Dean Fuller, we made clear that the Department of Agricultural Biochemistry felt that still a third teaching department of biochemistry was unnecessary, that it would dilute the limited resources already available in the University, undermine standards and encourage dichotomy in the University.

We indicated that the Department wanted to strengthen biochemistry by interdepartmental and intercollege cooperation. We further indicated that even though in some administrators' views there were awkward organizational problems in the University these would not be insurmountable barriers if everyone primarily concerned wanted a viable integrated program in biochemistry on the campus. Finally, it was made clear that as a Department it would be improper to address ourselves to the upper levels of university organization requesting realignments of departments and colleges. Our department was certain that we could function in any college serving a university wide function wherein the college itself would support a comprehensive program of biochemistry. These points of view expressed personally to Dean Fuller were reiterated in the Department's official reply dated February 9, 1962 to the Council on Instruction. (See appendix A page A55).

The staff members of the Department of Agricultural Biochemistry were disappointed to receive an initialled copy of the following letter dated March 1, 1962 sent to Dean Roy M. Kottman, College of Agriculture and Home Economics by Dr. Jackson W. Riddle, Vice Chairman of the Council on Instruction:

Dean Roy M. Kottman
College of Agriculture and Home Economics
Agricultural Administration Building
Campus

Dear Dean Kottman:

At its meeting on February 28, 1962, the Council on Instruction concluded its lengthy deliberations on the request of the Department of Agricultural Biochemistry to change its name to the Department of Biochemistry.

Since this request was first presented several years ago, the Council on Instruction has maintained that the problems of biochemistry on this campus cannot be solved by a simple change in the name of one department. Indeed, as we view the situation, such an action would serve only to aggravate the existing difficulties. By approving a proposal to change the name of either the Department of Agricultural Biochemistry or the Department of Physio-

logical Chemistry and Pharmacology to the Department of Biochemistry, implications for the other department would be created which would be prejudicial, discriminatory, and unfair. The Council on Instruction is unwilling to approve such a proposal.

Of those who submitted counter proposals or other correspondence relative to this situation, the consensus was that there is a definite and urgent need for a strong unified approach to biochemistry on our campus. The Council on Instruction vigorously endorses this view. Such a development is an absolute necessity, if this discipline is to achieve its proper share of recognition, support, and development, as it must if we are to consider ourselves a major comprehensive university. The Council on Instruction is firmly convinced that the discipline of biochemistry is basic to the development of other pure and applied biosciences; indeed it is presently the core of that disciplinary group.

The Council on Instruction believes that a unified approach to biochemistry is impracticable within the present organizational structure of the University. For this reason the Council recommends that our resources and strengths in biochemistry (from the Colleges of Agriculture and Home Economics, Arts and Sciences, and Medicine and from certain institutes) be combined in a single Department of Biochemistry with university-wide functions, and be established at the time of reorganization of our accademic structure. We are recommending to President Fawcett that the location of such a department should be suggested by the Permanent Planing Committee.

The Council on Instruction will transmit its recommendations to the Faculty Council for action when President Fawcett indicates that the time is appropriate to do so.

For the Council on Instruction.

Very truly yours,

Jackson W. Riddle, Vice
Chairman, Council on Instruction

JWR:eb
cc: President Novice G. Fawcett
Asst. Dean Austin Ritchie
Prof. F.E. Deatherage
Dean J.O. Fuller
Dean R.L. Meiling
Prof. J.B. Brown
Prof. A.B. Garrett
Assoc. Dean Richard Armitage

In this letter it was clear that those responsible for the academic development were not so much interested in resolving and lending leadership to the solution of the "Biochemistry problem" as they were preoccupied with reorganization of the university and thereby passing the buck to others. To have approved the Department's request would have been an admission by that Council that the certain departments budgeted in the College of Agriculture could indeed serve a university-wide general educational function in the same manner as certain departments budgeted in the Colleges of Education or Commerce. And such an admission, in their view, would have weakened their possition on the "super arts college" concept of a "comprehensive" university.

After studying with staff members the Riddle letter the Chairman of the Department of Agricultureal Biochemistry wrote to Vice President Heimberger as shown on pages 130-131.

For some months the only positive response to this letter was by Professor Alfred B. Garrett of the Department of Chemistry who kindly quoted from it as he urged the Council to "get on with the job before us".

Dr. Frederic Heimberger, Vice President
Office of Instruction and Research
Administration Building
Campus

Dear Dr. Heimberger:

I note with approval that the Council believes in the unified biochemistry program here at Ohio State University and that they recommend that plans be inaugurated through the Planning Committee for this new program. I hope now that work can continue with dispatch in effecting this new organization and in getting the work well underway. I will certainly support the recommendation of Dr. Deatherage that we get on with the job before us.

I, too, am willing to help where needed to assist in moving this program along. We have allowed altogether too much time to go by without giving intensive study and consideration to a determined activity for a successful program in biochemistry. I hope this now clears the decks for action and that the Committee will be prepared to proceed at once with their deliberations and recommendations.

Cordially yours,

A.B. Garrett
Chairman

ABG:tab
cc: Dr. Deatherage
Dr. Brown
Dr. Fuller

THE OHIO STATE UNIVERSITY
DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY
VIVIAN HALL, 2121 FYFFE ROAD
COLUMBUS 10, OHIO

March 9, 1962

Dr. Frederic Heimberger
Vice President, Instruction and Research
Administration Building
Campus

Dear Dr. Heimberger:

The letter of Dr. Jackson Riddle reporting the action of the Council on Instruction with respect to our request for a change in name of this department has been received. We note with considerable satisfaction that the Council believes in a unified biochemistry program and that you are recommending such a program. Much can be accomplished if the development of such a program can be initiated with reasonable dispatch. However, it would indeed be tragic if another eight years should pass without further progress on this problem. I would hope that work toward a unified biochemistry program might begin at once.

You point out that the Council on Instruction believes that a unified approach is impractical within the present organizational structure of the University. However, biochemistry in other universities has grown and served well in a similar organizational structure. My own feeling is that organization is only an instrument of action rather than an end in itself. I firmly believe that many persons involved in this case and in other difficult matters are people who are truly dedicated to the University and to the welfare of all its students. If I were not of this conviction, I would have long since left the Ohio State University, nor would I have continued to encourage, in honesty, potential scholars to come here.

You are aware of our many attempts to effect cooperative and progressive programs. We could itemize them if you wish. Some have been accepted--many rejected. Perhaps in these attempts to build biochemistry at O.S.U. some moves came at inopportune times or have been misinterpreted.

Perhaps no one in this University has spent as much time as I in studying the role of biochemistry here and in other institutions, educational and otherwise. It is our hope that all this does not go for naught. As you might assume, we have some ideas on implementation of the goal you have approved. My plea is, therefore, let us get on with the job before us. I will be pleased to meet and work with the Council on this

matter or with any others you might suggest. I am sure you realize that the hour is late for biochemistry and that much needs to be accomplished. Any lengthy reorganization of two, three, or five years before anything would be done would be almost fatal to the cause which we now agree should be University policy.

Sincerely yours,

F. E. Deatherage
Chairman

FED/db

cc President Novice G. Fawcett
Dean Roy M. Kottman
Dr. Jackson W. Riddle
Dean J. O. Fuller
Dean R. L. Meiling
Prof. J. B. Brown
Prof. A. B. Garrett
Assoc. Dean Richard Armitage

Although the Council on Instruction's response to the Department's request was discouraging in that it gave precedence to the "organizational" aspects, it did turn the problem over to the President's Permanent Planning Committee. In putting the responsibility on this Committee further delay was inevitable because the committee was concerned with other problems in the university; among these was the particular one as to how to handle the great mass of students to arrive in the years immediately ahead. President Fawcett, on authorization of the Faculty Council in December of 1959, had appointed what became known as the President's Permanent Planning Committee consisting of:

Professor James F. Fullington, Former Chairman and Professor of English and Former Dean College of Arts and Sciences, Chairman
Professor Henry A. Bruinsma, Music
Professor Clifford L. James, Economics
Professor John B. Brown, Physiological Chemistry
Associate Professor Edward Q. Moulton, Civil Engineering, and Assistant Dean, Graduate School
Professor John A. Ramseyer, Education
Professor Richard A. Bohning, Botany, and Assistant Dean, College of Agriculture and Home Economics

This committee had spent over two years gathering information and meeting with faculty members, deans and other administrative officers relating to the university organization which might best serve the University in the ensuing decade of rapidly increasing enrollments. This committee on May 15, 1962 sent to all members of the University Faculty a "Report of the Organization of the Ohio State University (Phase I)".

In essence the report proposed the formation of "Basic Colleges" of the Humanities, the Life Sciences, the Physical Sciences, and the Social Sciences. These would be organized from the departments resulting from the liquidation of the College of Arts and Sciences and removing the so-called basic or fundamental departments from the Colleges of Agriculture, Education, Commerce, and Medicine. Next, all students would enter a new "University College" and would then transfer as third year students to any of the ten colleges: Agriculture and Home Economics, Commerce and Administration, Education, Engineering, Humanities, Life Sciences, Pharmacy, Physical Sciences, Social Sciences or Veterinary Medicine. The report suggested college organization by departments and noted as follows: 'Agricultural Biochemistry; Physiological Chemistry and Pharmacology. These two departments should be joined in a single Department of Biochemistry in the College of Life Sciences. A separate department of Pharmacology might eventually be established in either Life Sciences or Medicine. The matter

deserves further study. Consideration might be given to a special department of Medical Biochemistry in the College of Medicine."

Professor John B. Brown, in a minority report, objected to some of the proposals - those affecting his own department and the College of Medicine with the following letter dated May 17, 1962 which was appended to the report.

Professor James Fullington, Chairman
Permanent Planning Committee
Denney Hall
Campus

Dear Professor Fullington:

I am in agreement with most of the report of the Planning Committee as an "idea" for study by the President, and later by the faculty, - this, in spite of the fact that there is serious doubt in my mind, often expressed in the committee, because of my belief that complete reorganization of the university at this time or in the future may present many more problems than it settles.

My principal dissent from the report stems from the departmental alignment of the College of Life Sciences. Creation of this college will present major problems since it involves withdrawing three departments from the College of Agriculture, two from the College of Arts and Sciences, and the three preclinical departments from the College of Medicine. I will not argue the pros and cons of these proposed changes, except with respect to the placement of these preclinical departments of the College of Medicine, namely Anatomy, Physiological Chemistry, and Physiology. I do not know how the members of the faculties of these departments feel in this matter, but whatever plan of reorganization may result from the report and its subsequent study, it is my opinion that these preclinical departments must be retained in the College of Medicine. More and more are these disciplines becoming fundamentally and intimately related to the total program of medical education and research. Any disassociation from the College of Medicine can only weaken the attainment of objectives in these programs. Furthermore, continuation of placement of these departments in the College of Medicine may be essential to professional accreditation of the college. This is my conviction, and my reason for dissent from the main report.

Cordially yours,

J. B. Brown, Chairman
Department of Physiological
Chemistry and Pharmacology
Director, Institute of Nutrition
and Food Technology

Professor Brown's concern that "complete reorganization of the university at this time or in the future may present more problems than it settles" was also the justifiable concern of many faculty members. The next seven years would indicate that this concern particularly as regards the biological sciences, was more than justified. But Professor Brown also presented the essential status quo position of the College of Medicine wherein, traditionally, colleges of medicine rarely serve a basic educational function in a comprehensive university.

The President's Permanent Planning Committee solicited comments, criticisms and suggestions from individual faculty members, departments and colleges. As might be expected there was much discussion of the Phase I Report by all members of the University faculty. After some deliberation the Department of Agricultural Biochemistry responded favorably noting that the goals set forth by the Committee were those of the Department and to reach these goals many proposals had been submitted to the Council on Instruction. A copy of the Department's proposals to the Council was sent to the Committee noting wherein the objectives of the Department concurred with these of the Committee and that finally the Council on Instruction had tacitly concurred in the Department's objectives even though the Council had turned the biochemistry problem over to the Committee. The Department did note that its program had been nurtured and vigorously supported by the College of Agriculture and that for any program in biochemistry to thrive and make up for lost time at the Ohio State University any new college administration would have to very strongly support the new Department of Biochemistry.

For the entire 1962-63 school year the deliberations of the Committee continued and in the spring of 1963, the Committee devoted some time for more detailed study of biochemistry. Faculty members and chairmen of both departments appeared privately with the Committee. Following these conferences the Committee decided that nothing concrete should be undertaken until Professor John B. Brown, Chairman of Physiological Chemistry, and member of the Committee, retired in 1964 after reaching the mandatory retirement age of 70. In order to neutralize the situation they proposed that the chairman of Agricultural Biochemistry also not take any actions of a policy nature while four faculty members - two from the Department of Physiological Chemistry and two from the Department of Agricultural Biochemistry form a Subcommittee of the President's Permanent Planning Committee to consider the following:

"1. A review of the plans for the proposed biochemistry building which will take into account both present and future needs.
"2. Cooperative measures which might utilize our present resources in biochemistry more effectively in teaching and in research.
"3. Other actions which should be taken to promote and strengthen biochemistry on this campus." This action of the Committee presumably had the support of Dean Roy M. Kottman of the College of Agriculture and Home Economics and Dean Richard Meiling of the College of Medicine.

Professors Richard O. Moore and Junius F. Snell were appointed to represent Agricultural Biochemistry and Professor David G. Cornwell and recently promoted Associate Professor Keith E. Richardson were appointed to represent Physiological Chemistry and Pharmacology. This Biochemistry Subcommittee was shortly authorized to begin work and their deliberations continued for some months.

It was becoming increasingly clear that the program and goals of the Department of Agricultural Biochemistry would become more confused rather than being quickly clarified. The action of the President's Permanent Planning Committee put the Department's affairs in a state of suspended animation and impending disorganization. The outlook for an integrated biochemistry program at the University in the near future did not appear bright. In fact Professor Brown's minority report clearly indicated opposition from the College of Medicine and the Committee's report itself had left the door open for a separate "Department of Medical Biochemistry" or what could appear to be the status quo. The younger staff members in the Department of Agricultural Biochemistry were becoming increasingly discouraged and as a consequence Assistant Professors Robert Bernlohr and Palmer Rogers, Jr. resigned to take faculty positions at the University of Minnesota and shortly thereafter both were invited to membership in the American Society of Biological Chemists.

To replace these faculty members we were fortunate to retain Dr. David H. Ives and Dr. George S. Serif - both appointed Assistant Professors. Dr. Ives a graduate in 1955 of Cornell College (Iowa) earned his Ph. D. in Physiological Chemistry at the University of Minnesota in 1960 and had been a postdoctoral Fellow with Professor Van R. Potter at the University of Wisconsin. Dr. Ives' special interest is nucleotide metabolism; deoxyribonucleic acid (DNA) biosynthesis; and feedback control. Dr. Serif, a native of Saskatoon, Sask., Canada, earned his B.S., 1951, M.S., 1953, Ph. D., 1956 all from McMaster University, Hamilton, Ontario. After spending some time as a Postdoctoral Fellow with Professor Samuel Kirkwood at the University of Minnesota he became Assistant and then Associate Professor of Biochemistry at the University of South Dakota before joining this Department at OSU. Also in 1963 Assistant Professor John E. Gander was promoted to Associate Professor.

The Subcommittee of Professors Moore, Snell, Cornwell and Associate Professor Richardson representing the Departments of Agricultural Biochemistry and Physiological Chemistry, respectively, continued their deliberations during late 1963 and 1964. Though there was much agreement as to what an integrated biochemistry program in a comprehensive university should be, the traditional medical school operational philosophy could not be reconciled to the broader needs of the University occasioned by the planned reorganization proposed by the Permanent Planning Committee and still being debated by the University Faculty.

The academic turmoil and indecision in the entire university was only heightened by the impending retirement of Vice President for Instruction Frederic Heimberger. Nothing was to be done to commit his successor who was to be Dr. Robert Weaver, Vice President of the State University of Iowa, Iowa City. In view of the general confussion in the entire university and with biochemistry itself Associate Professor Gander resigned in 1964 to accept an Associate Professorship at the University of Minnesota. It began to appear that the Department of Agricultural Biochemistry of the Ohio State University was being used as a training ground for University of Minnesota faculty.

Dr. George A. Barber joined the Department in late 1964 as Associate Professor. He had earned his A.B. from Rutgers University in 1951 and his Ph.D. in 1955 from Columbia University. He has served as Post-doctoral Fellow and Research Associate at the University of California during 1955-57 and 1960 to 1964. Between these times he had been Biochemist at the Connecticut Agricultural Experiment Station. Dr. Barber is well recognized for his work in the metabolism and biosynthesis of carbohydrates. He left OSU after a few months and went to the University of Hawaii until 1968 when he returned as Professor.

Also in 1964 Dr. Thomas I. Diamondstone A.B. 1954, B.S. 1957, University of Chicago; Ph.D., Rutgers University, 1963 was appointed Assistant Professor. He had served as a Postdoctoral Fellow at the University of Pennsylvania. Dr. Diamondstone's special field of interest is in the thermodynamics of phosphate esters and in kinetics of enzyme reactions. At the close of the 1968-69 academic year he has accepted a faculty appointment at Jefferson Medical College in Philadelphia.

The lack of academic direction in the entire university and the actions of the Presidents' Permanent Planning Committee, which stipulated that neither biochemistry group should be permitted more than a sustaining operation until the university reorganization had become a reality essentially left chairmanship responsibilities dangling in mid-air for both departments of biochemistry. Professor Fred E. Deatherage left the Chairmanship to join the Ohio State University/United States Agency for International Development program at the University of São Paulo, Superior School of Agriculture "Luiz de Queiroz", Piracicaba, S.P., Brazil as adviser in food science and technology. The Ohio State University had made outstanding progress in its foreign educational programs particularly in India under the continuing vision and leadership of Associate Dean T.S. Sutton and was starting a new venture in that Latin American country. Because of his experience in graduate education of foreign students and in food problems in other countries as well as in the U.S.A. the Brazil/OSU program offered a new professional challenge. But even in Brazil he was to find the university reorganizational conflicts would be felt in a negative way because some OSU professors there would find themselves in departments outside the College of Agriculture and Home Economics and in some ways considered heathens by the College of Agriculture they had so faithfully served. That College was

to suffer in the reorganization and the new departmental alignments to be affected would cause a resurgence of latent provinicalism in the leadership of the College.

In September 1964 Professor Richard O. Moore was made Acting Chairman of the Department of Agricultural Biochemistry and Professor David Cornwell was made Acting Chairman of the Department of Physiological Chemistry on the occasion of Professor J. B. Brown's retirement in June 1964. Dean Roy Kottman and Dean Richard Meiling had agreed, in accordance with the wishes of the Permanent Planning Committee, to appoint only acting chairmen of Agricultural Biochemistry and Physiological Chemistry, respectively, until the "biochemistry problem" was solved. The desire of the President's Permanent Planning Committee that its Biochemistry Subcommittee have no department chairmen in its makeup was suddenly negated because it found itself with two "acting" chairman. The result was in fact, that the subcommittee agreed to disagree over the College of Medicine control of biochemistry on the campus. The Department of Agricultural Biochemistry had furnished to the Council on Instruction and the President's Permanent Planning Committee much evidence that through the years medical school biochemistry groups almost never had served a university wide function in a comprehensive university such as OSU. For this reason the faculty of the Department had unanimously indicated that it felt it would be unwise to try to put a university-wide integrated department of general biochemistry in the College of Medicine.

The biochemistry situation which Professor Deatherage and the Department of Agricultural Biochemistry had for so many years been trying to solve with the cooperative efforts of other interested departments on the campus became suddenly quite real to the Department of Physiological Chemistry. Almost simultaneously with the retirement party given to honor Professor J. B. Brown, Professor Cornwell and Associate Professor Richardson dispatched the following letter to the Permanent Planning Committee on June 2, 1964. (Assistant Dean Moulton of the Graduate School had replaced Professor James Fullington as Chairman).

Dean Edward Q. Moulton, Chairman
President's Permanent Planning Committee
Denney Hall
Campus

Dear Dean Moulton:

Biochemistry as an academic discipline on this campus requires immediate and clear definition. The problem is urgent for several reasons:

(a) authorization to appoint a chairman
(b) staff recruitment
(c) retention of present staff

(d) decisions on a program best suited for the undergraduate major (College of Arts and Sciences)
(e) meaningful cooperation between other departments and divisions such as Nutrition, Biophysics, and Chemistry on recruitment and joint course offerings

We feel that this urgent problem requires a decision which can be implemented in the near future. This decision must necessarily include the evaluation of both past performance and present intent. The College of Medicine has demonstrated its willingness to support a department of general biochemistry by actively recruiting and supporting plant biochemists, bio-organic chemists, and biophysical chemists as well as enzymologists interested in problems of human metabolism.

Furthermore, the Department of Physiological Chemistry has voted unanimously for a department of general biochemistry within the College of Medicine. We, therefore, recommend that a department of biochemistry with university responsibility be established in the College of Medicine.

Sincerely yours,

David G. Cornwell, Professor

Keith E. Richardson, Associate Professor

DGC:mcs

After Vice President John Weaver took over from Vice President Heimberger he was face to face with impending reorganization and/or disorganization problems. He was aware of the "biochemistry problem" and even spoke briefly with Professor Deatherage immediately before the latter's departure for Brazil. Within a few months Vice President Weaver negated the so-called agreement promoted by the Planning Committee to the effect that only acting chairmen for biochemistry groups be appointed until a decision had been reached on university reorganization. This was done by his concurrence in Dean Meiling's appointment of Professor Cornwell as Chairman (not Acting Chairman) of its Department of Physiological Chemistry and the subsequent rapid addition of staff to thatdepartment. At the same time however the Department of Agricultural Biochemistry was forced to subsist "status quo" with acting chairmen for almost another four years. As time would show this unilateral display of favoritism by Vice President Weaver was an indication that the College of Medicine would have its own biochemistry department and that Agricultural Biochemistry would either cease to exist or be a part of some contemplated new academic unit.

With Dr. John Weaver taking over the Vice Presidency for Instruction, President Fawcett indicated that the President's Permanent Planning Com-

mittee might better be made responsible to Vice President Weaver rather than to himself in as much as the Committee had made extensive studies of university organization, particularly as regards academic affairs. To implement the change and to place all academic responsibility in Vice President Weaver's hands the members the President's Permanent Planning Committee resigned and this group ceased to exist. In its place Vice-President Weaver established and appointed what was called the Academic Personnel and Planning Board, or simply the Academic Board. This Board, was composed of

Dr. Richard Armitage, Dean of the Graduate School
Dr. Alfred Garrett, Vice President for Research
Dr. Edward Moulton, Associate Dean of Faculties
Dr. Jackson Riddle, Associate Dean of Faculties
Dr. John C. Weaver, Vice President for Instruction and Dean of Faculties

On October 4, 1965, the Academic Board proposed to the Council on Instruction that a College of Biological Sciences be created. The first paragraph of this letter follows:

"The recommendations embodied in this proposal, deriving from earlier studies culminating in the recommendations of the President's Permanent Planning (Phase I Report, May 15, 1962), are designed to create an appropriate environment for the strong development of the basic biological sciences. There is much evidence that these disciplines are among the least distinguished in which advanced undergraduate and graduate programs are offered at this university. Whatever the cause this state of decline and lack of modern development prevail precisely at a time when radical curricular changes and research efforts are being experienced in these disciplines throughout the world as new fields emerge and exciting fundamental discoveries are made."

This stinging blanket indictment of a large section of the university community did not mention any of the notable accomplishments in the biological areas and there had been and were some. In reality it was an admission that there had been lack of academic leadership at the highest levels and not so much at the lower professiorial or action levels. Academic administration by veto had been a dismal failure. Deans had been too often concerned about building their empires rather than doing what was best for students. Intellectual snobbery, favoritism and the dichotomy of university life had thwarted progress too long, but no mention of these sins had been made in this letter nor was there any call for enlightened unselfish objective leadership. Be that as it may, the desperate call for action now indicated that something was in the making. But what? Only time would tell. The rush to do something - anything - was the order of the day - and three of the five Board members would be gone from the university within the year. The Department of Agricultural Biochemistry had tried desperately for eleven years to get the message across and get assistance in its growth from deans, councils

and vice presidents - but to no avail. Now, as the call for action came, the National Institutes of Health declined to extend further their Biochemistry Training Grant to the Department of Agricultural Biochemistry because of the sterile academic climate in the University. The N.I.H. had six years earlier pointed up the problem to the University as far as biochemistry was concerned but no one in the laggard academic offices seemed to listen because it was only a department in the College of Agriculture that was concerned and involved. Why aid Agriculture?

Within six days the Council on Instruction passed to the whole university faculty the Academic Board's recommendations and asked for debate and action before the end of the academic year so that the new College of Biological Sciences would come into being on July 1, 1966. The Board proposed that the College of Biological Sciences be composed of six departments.

Biochemistry	Botany
Biology	Microbiology
Biophysics	Zoology

The Biology department would be a service department teaching general biology, anatomy, and physiology to undergraduates and have no graduate programs. The Biophysics department would have only graduate programs whereas, the other four would have programs at all levels of the University.

To effect this organization Microbiology would leave the College Arts and Sciences (that College's only biologically oriented department) and Agricultural Biochemistry, Botany and Zoology would be taken from The College of Agriculture. The College of Agriculture was offered the possibility of having new Departments of Entomology, Plant Pathology and Natural Resources. The College of Medicine would shed undergraduate teaching in anatomy, physiology and biochemistry and confine its teaching to professional students and graduate students to the master's and doctorate levels in the following departments:

Anatomy
Medical Biochemistry
Medical Microbiology
Medical Pharmacology
Physiology

The biggest loser in the reshuffle would be the College of Agriculture. The College of Medicine would presumably be self contained as it would be authorized to set up its own program in microbiology to the exclusion of the remainder of the University and thus the University would now have two microbiology departments. Medicine would retain its biochemistry group and so the same two departments of biochemistry would be essentially unchanged. The new organization took cognizance of the facts that medical schools rarely serve a university-wide educational function; that at the graduate level the university would have competitive departments and programs

in both biochemistry and microbiology; and that the new order of things would not guarantee cooperation between these groups. Furthermore, the new alignment would encourage the College of Agriculture to become more provincial and more isolated from the university community - a position repugnant to many faculty members in the College of Agriculture who traditionally had contributed much to the general welfare of the University. For the first time in its history that College would have no department to serve a university-wide function. Politically speaking, the move to form a College of Biological Sciences, if successful, would cause sufficient dislocation to force additional reorganization-and relatively soon.

Dr. Edward J. Behrman joined the Department of Agricultural Biochemistry in the Autumn of 1965. He was a 1952 B.S. graduate of Yale who took his Ph.D. in 1957 from the University of California. From that date until coming to OSU as Assistant Professor he had served three years as Research Fellow at New England Deaconess Hospital, followed by one year at Harvard Medical School and four years as Research Associate at Brown University. At this time also Assistant Professor Serif was promoted to Associate Professor.

A short time later Dr. Charles A. Boudreau, B.S., University of Washington, 1954; Ph.D., University of Hawaii, 1963, and Postdoctoral Fellow, Johns Hopkins University 1963-66 was appointed Assistant Professor. With this appointment the full time staff of the Department was as follows: Professor Richard O. Moore, Acting Chairman, Professor J. F. Snell, Professor F.E. Deatherage (assigned to Brazil), Associate Professor Serif, Assistant Professors David Ives, Joseph Mendicino, Donald K. Dougall at the Ohio Agricultural Experiments Station in Wooster, Edward Behrman, and Charles Boudreau. With the exception of Professor Deatherage these were the faculty members within the Department who would debate the issue of the new College of Biological Sciences. Of these only one had been at the University more than five years and only two more than three years.

As might be presumed for six months in late 1965 and early 1966, hearings, debate and maneuvering of faculty members and deans overshadowed the teaching and research activities of a large segment of the University. The faculties of the departments primarily affected by proposed transfer to the new College were polled as to their wishes. Lines were drawn for the crucial debate and vote in the Faculty Council on the formal move by the Council on Instuction to establish a College of Biological Sciences essentially like that proposed by the Academic Board. Anguished commentaries bordering on blood letting marked the heated sessions. When the final vote was cast, however, the Faculty Council supported the new College of Biological Sciences. The Board of Trustees ratified the action of the Faculty Council and so on July 1, 1966, the Department of Agricultural Biochemistry of the College of Agriculture and Home Economics became the Department of Biochemistry of the College of Biological Sciences of The Ohio State University. We had suddenly became acceptable as a Department of Biochemistry -changed name and all. How sad! For twelve

years the department had fought for its position to try to serve the entire university with its program of general biochemistry. These twelve years of hope, of frustration and of turmoil had taken its nasty toll - a cost to the department and to the university in money, time, and personnel so unnecessary because, although the department was now in a different college, its relative position had changed so little - almost none, it appeared that now the Department might more effectively prosecute its program to serve the university needs outside of medicine and dentistry. Or could it, the upheavals of reorganization were just beginning and turmoil was to continue.

The Department had from its beginning served well the College of Agriculture and the University. The College of Agriculture had indeed supported effectively the Department's program and nurtured its growth in so far as resources would permit. To be sure the fundamental role of biochemistry to agriculture had been difficult for farmers to comprehend but this is understandable. But this lack of comprehension was also true to some extent of some areas within the College and the Department was never politically powerful in the College. Furthermore the College of Agriculture more than any other college in the University was a meeting point of intramural university and extramural state politics. The Department had noted many times the support it had received from the College of Agriculture and had often displayed this loyalty in trying to avoid initiating organizational upheavals in its dealings with University Councils, Boards and central academic administrators. But the traditional university dichotomy could not be ignored. That the Department voted to leave the College was not so much a vote against the College of Agriculture even though in the last few years effective College support had deteriorated, but rather a vote noting that many in the University academic administration were indeed blocking its progress because the Department was in the College of Agriculture. Furthermore, it appeared to the staff of the Department that, if the President's Permanent Planning Committee report were to be realized as inferred by the Academic Board and the Council on Instruction, then, the Department should indeed be in the College of Biological Sciences.

The crucial debate in the Faculty Council proved to be even more anti-Agriculture than expected, thus reflecting the fact the spokesman for the College of Agriculture was not attuned to the feelings, goals and attitudes of university professors in general. Internal relations within the university had deteriorated even if the external political and public relations appeared to be in order for the College of Agriculture and Home Economics.

A particularly bitter blow for the College of Agriculture was the action of the entomology group of the Department of Zoology and Entomology. Notwithstanding the blanket pointed criticism of the Academic Board, referred to above, entomology at the Ohio State University did have a position of leadership and high respect in its field. In its proposal the Academic Board had indicated that the College of Agriculture and Home Economics in the new organizational set up might properly retain entomology and plant

pathology by setting up new departments in these disciplines which traditionally are associated with colleges of agriculture. Notwithstanding the suggestions of the Academic Board, the professors of entomology voted to secede from Agriculture and to become affiliated with the new College of Biological Sciences and later to form a department of its own. Thus this distinguised group was lost by the College of Agriculture and Home Economics.

The Council on Instruction in its proposal to the faculty had strongly recommended that the new College of Biological Sciences be developed under the leadership of an "outstanding biologist as dean". But the July 1, 1966 date set for the beginning of the new college offered no time for thoughtful reorganization or the tedious and time consuming task of finding a dean and so Dr. Ralph Johnson of the Institute of Nutrition and Food Technology, a man of almost no academic experience in a teaching department of a university was appointed Acting Dean. (Incidental to the reorganization this Institute detached itself from Food Technology and Assistant Director of the Institute's Laboratories, Dr. Robert L. Clements, joined the Department of Horticulture).

As Acting Dean Johnson was to soon find out, the formation of the College of Biological Sciences also signalled the beginning of grave disorganizational problems throughout the entire university. And these would affect the new College as well. Three of the five members of the Academic Board which rushingly instituted the whole affair left before the reorganization for which they were responsible could be implemented. Indeed normally it would have been these three men to implement and expedite the change they wanted so much; Vice President Weaver left the University to become President of the University of Missouri; Associate Dean Moulton left become President of the University of South Dakota, and Associate Dean Jackson Riddle left academic life entirely to be a medical administrator in industry. (Dr. Moulton returned the Ohio State University in late 1968 to become Executive Assistant to the President and Secretary to the Board of Trustees.) In addition Dean J. Osborn Fuller, sensing that his College of Arts and Sciences would be broken up also left the University. Other shifting of personnel took place. For the new Department of Biochemistry, Professor Richard O. Moore, Acting Chairman for two years asked to be relieved of that responsibility and was replaced by Professor J.F. Snell as Acting Chairman.

Coincident with all of these changes and to at least try to cope with rapidly changing teaching responsibilities in the new Department of Biochemistry, Dr. Paul L. Zubkoff joined the Department as Assistant Professor. He received his B.A. in 1956 from the University of Buffalo, M.S. from George Washington University in 1958 and Ph.D. from Cornell in 1961. Dr. Zubkoff had had postdoctoral experience at the University of California and at the Massachusetts Institute of Technology.

Dr. John E. Corbally, Jr. succeeded, Dr. John Weaver as Vice President. He had served as Executive Assistant to President Fawcett and was

given considerable additional responsibility in academic matters and was made Vice President for Academic Affairs and Provost. Vice President Corbally was faced with a truly formidable task in implementing the organization of the new College of Biological Sciences, and, through his leadership, to try to solve other organizational problems caused by the dislocations incident to the new College.

For over a year a Dean for the new College was sought and a number of candidates were frightened at trying to organize a new college within a framework of impending further reorganization and dislocation in the University. Without a dean with some leadership authority disarray in the new college continued and finally in 1967, Dr. Johnson's appointment was changed from Acting Dean to Dean. He then was in position to try to satisfy the wishes of the faculty of the College of Biological Sciences.

Upon becoming Dean in late 1967 Dr. Johnson had to come to grips with a new permanent organization in the College which had been under discussion for some months by the faculty members brought together from diverse units of the university. He appointed Dr. George S. Serif, who had been recently promoted to Professor as Chairman to replace Acting Chairman J. F. Snell. At this time operations of the Department were closed out at the Ohio Agricultural Experiment Station and transferred to the University. This meant that Professor J. F. Snell would become full time on the University budget and that on his return from Brazil the same would apply to Professor F. E. Deatherage. In addition Dr. Donald K. Dougall elected to leave the Station in view of its decision to discontinue a biochemistry group at Wooster. Dr. Dougall joined the Department of Botany with joint appointment in the Department of Biochemistry.

1967 saw further realignment of colleges in the University. The Faculty Council supported the proposal of Vice President and Provost Corbally and his new Council on Academic Affairs to dissolve the College of Arts and Sciences and to form four additional Colleges of - Humanities, Mathematics and Physical Sciences, The Arts, and Social and Behavioral Sciences. To do this it was necessary to transfer "basic" areas from the Colleges of Education and Commerce and Administration. These changes were no less traumatic than those associated with the formation of the College of Biological Sciences. Now the University had five so-called "basic" colleges, a series of professional colleges - Agriculture and Home Economics, Engineering, Education, Administrative Science, Pharmacy, Medicine, Law, Veterinary Medicine, Dentistry, and Optometry - and Graduate School. So now the pattern had been set and only time could judge whether the new structure could better serve the needs of the University and its students than the old structure.

The immediate organizational problem for the College of Biological Sciences was caused by the facts that the Institutes of Vision and Nutrition were brought into the College; that the College was given responsibility to

teach "general biology", anatomy, embryology and physiology at the undergraduate level (for many years these were taught in departments budgeted in the College of Medicine rather than in Zodogy), that graduate programs in these areas were to remain in Medicine): and that the biophysics program was made the responsibility of the College instead of the Graduate School.

In hopes that perhaps somehow the new College could become at one time more highly centralized in its administration (and could provide funds for "professional" administrators to do the chores of department chairman) and more disperse in its academic program, the faculty of the college debated the so called disciplinary departments versus "the academic faculty concept". By the narrowest of margins which Dean Johnson proudly noted was due to the votes of new young faculty members, the faculty voted to have:

The Academic Faculty of Biochemistry and Molecular Biology
The Academic Faculty of Biophysics
The Academic Faculty of Entomology
The Academic Faculty of Microbial and Cellular Biology
The Academic Faculty of Genetics
The Academic Faculty of Population and Environmental Biology
The Academic Faculty of Organismic and Developmental Biology.

Following the vote the pooled faculty members were then asked to indicate which faculties they wished to be associated with, and, if they wanted to be affiliated with more than one group, which faculty would they be prefer as their field of primary concern. Such a procedure presented problems for the Academic Faculties, For the most part, the Academic Faculties had only acting chairmen and they had almost nothing to say in organizing or selecting members in their respective faculties. To add to the confusion five of the new Faculties were discipline oriented with the two largest disciplinary groups from the old Botany and Zoology Departments dissolved and these faculty members had to go to the two so-called non-disciplinary Faculties of Organismic and Developmental Biology, and Population and Environmental Biology. These professors for the most part were unhappy. The result was that the botany professors reflecting the physiological tradition of the former Department of Botany went to the former group and the zoology professors went to the latter. To the Faculty of Organismic and Developmental Biology went the responsibility for teaching anatomy, embryology, and animal physiology although that Faculty was mostly made up of professors of botany. To add to the confusion still further there were no Graduate School approved graduate programs in any of the Faculties except Biochemistry for the Faculty of Biochemistry and Molecular Biology, and Microbiology for the Faculty of Microbial and Cellular Biology, and Zoology and Entomology for Entomology.

Within a few months after the grand reshuffle of faculty in the new College, Dean Ralph Johnson resigned and returned to his home state of Utah in early 1968. In his place Professor John D. Brigs was appointed

Acting Dean and the search for a new Dean was begun again. A number of candidates were suggested and several were brought to the University from the outside to look over the situation but none of these candidates was appointed Dean. Finally, from a groundswell of discontent with over three and a half years of disorganization and searching on the outside for a dean a number of faculty requested that Associate Dean Richard Bohning of the College of Agriculture and Home Economics be appointed Dean of the College of Biological Sciences. And so he was, effective January 1, 1969. Dean Bohning had given outstanding service on a number of important University Communittee including the President's Permanent Planning Committee. Dean Bohning, a plant physiologist, was Professor of Botany when he joined the College of Agriculture administration and on the retirement of Associate Dean T.S. Sutton, assumed responsibility for the academic affairs of that College in 1967. In the short time that Dean Bohning has had his new responsibilities he has made effective progress in setting the course of the College of Biological Sciences to accomplish its mission. To reduce confusion, to allay anxieties, and to avoid delay regarding graduate programs he asked and received the support of the Faculty of the College to change the names of the Academic Faculties of Organismic and Developmental Biology and of Population and Environmental Biology to Botany and Zoology respectively so that all Academic Faculties would be discipline oriented and also so that teaching and other academic responsibilities of the several faculties might coincide with budgetory and operational matters.

The general university reorganization presented some concerns about common university requirements for all baccalaureate degrees and for the "sacred" untagged B.A. and B.S. degrees versus the multiplicity of tagged degrees. One result effecting all five of the "basic" colleges is that another organization has been superimposed upon them and it is known as The Colleges of the Arts and Sciences. This organization was originally conceived as a vehicle for solving common problems in the "basic" colleges and to decide what general requirements would be made of all students (not just these in the Colleges of Arts and Sciences) in the University. In this latter consideration, The Colleges of the Arts and Science was overruled in the Faculty Council. In 1969 the Colleges of the Arts and Sciences has rather become something of a super regulatory college with a Senate composed of one representative from each department of the five colleges, and a Dean of Undergraduate Programs with a Curriculum Committee. This supercollege has become the degree granting agency for the five colleges.

The initial confusion of transfering student records and setting up counseling offices, with the very experienced Miss Frances Naylor in charge, to effectively handle student affairs in the new College of Biological Sciences had began to subside; and relations between students and college and students and professors had settled into a pattern when suddenly all of this was undone by removal of student relations to the new super group - The College of the Arts and Sciences. To illustrate, whereas in the College of Agriculture and Home Economics, there is professorial counseling and advising of students throughout their undergraduate studies in that College, there is

in the College of Biological Sciences no such student - professor intercourse. In fact, the College of Biological Sciences along with the other four "basic" colleges have only faculty but no students and no professorial counseling on a continuing basis. The Colleges of the Arts and Sciences, and its Dean of Undergraduate Programs have all the students with a battery of counselors much as the old College of Arts and Sciences had. So in 1969, an incoming student registers in the University College, and then transfers from there to an upper level college. However, if the Student is interested in biochemistry he will be transferred not to the College of Biological Sciences and the Department of Biochemistry for counseling and guidance throughout his undergraduate studies but to The Colleges of Arts and Sciences.

From the author's point of view, it appears that through almost a decade of reorganization, we have made little progress is overcoming the dichotomy and the conservative academic liberalism and the liberal academic conservatism that has so plagued the Ohio State University throughout its history in properly fulfilling its mission as a comprehensive university. Have we not yet arrived to the point of educational maturity of entrusting educational programs to the five "basic" colleges but to only a gifted few in a super-organization? For the five "basic'colleges, which accounted for only one third of the baccalaureate degrees (and 109 of these were "tagged") in the June 1969 commencement, there is interposed an additional level of administrative authority in the form of The Colleges of the Arts and Sciences so that in many ways the five "basic" colleges are more like departments rather than autonomous colleges. The reorganization has led to more centralization and more levels of administrative bureaucracy - not less. The reorganization has in the so-called "basic" colleges, but not in the "professional" or "applied" colleges, served to make professors even more removed from students and their concerns. In view of the student unrest of this era the reorganization may have solved some problems for administrative purposes but has the reorganization addressed itself primarily to the needs of the students? Only time will tell.

It may be fair to ask at this point. Have the sacred untagged degrees Bachelor of Arts and Bachelor of Science degrees out lived their usefulness? Or, have the academic purists forced on the rest of the academic community a plethara of tagged baccalaureate degrees that has indeed smothered the traditional B.S. and B.A. degrees to a minority rank? Is the holder of a tagged degree any less educated than a holder of an untagged degree? It is doubtful. At least we hope this is so because the Ohio State University in the 1968-69 academic year awarded only 1022 B.A.'s and 588 B.S.'s out of a total of 5446 baccalaureate degrees; all others were tagged Bachelor of --, 37 kinds. For this Department, in its transferral from the College of Agriculture and Home Economics, decreased the kinds of bachelor's degrees by one for the same program which lead to the Bachelor of Science in Agricultural Biochemistry degree leads now only to B.S.

The long period of departmental unrest and subsequent reorganization presented to the Department of Biochemistry some difficult problems. Financially the Department suffered because, as noted many times in this history, the graduate program largely depends on faculty member's ability to attract grants for stipends and for faculty and graduate student research costs. The discouragement and discommotion of the 1960's brought to the Department 9 resignations and 11 appointments. Many of the resignations were of established professors-investigators who were attracting funds whereas many of the new appointments were of persons yet to establish themselves; and outside funds is not easily obtained by these new faculty members. Reference has already been made to the loss by the Department of the National Institutes of Health Training Grant support in 1965 due to the unhealthy academic climate within the University itself. The Department's financial bind was eased somewhat in a temporary manner by special allotments from the new College of Biological Sciences. The number of qualified graduate students in the department had decreased but this was more than overshadowed by rapidly increasing enrollments in all biochemistry classes and these increases called for new staff.

In the autumn of 1968, Professor Deatherage returned to this Academic Faculty (Department) from his assignment in Brazil on the Ohio State University/U.S. Agency for International Development program, and Dr. George A. Barber rejoined the Department as Professor. Assistant Professor Joseph Mendicino resigned to become Associate Professor of Biochemistry at the University of Georgia. Dr. Roy A. Scott joined the Department as Associate Professor. He earned his B.S. in 1958 and Ph.D. in 1963 from Cornell University where he studied biophysical chemistry under Professor H.A. Scheraga. He stayed at Cornell as Assistant Professor from 1963-65 and spent two years at the University of Hawaii before coming to OSU. Dr. Elizabeth Gross was appointed Assistant Professor also in 1968. Her especial interest is in photosynthesis and she was awarded her B.A. in 1961 and her Ph.D. in 1967 at the University of California. She was postdoctoral Fellow, at the Institute of Botany, Stockholm, Sweden and at the Charles F. Kettering Laboratory of the Kettering Foundation in Yellow Springs, Ohio, before joining the Department. Associate Professor David G. McConnell was transferred from the Institute of Vision and the Academic Faculty of Biophysics to the Academic Faculty of Biochemistry and Molecular Biology. Professor McConnell originally trained in physiological psychology has his research interest in visual processes. He earned A.B. and A.M. degrees from Columbus in 1949 and Ph.D. from the University of Indiana in 1957. He first came to OSU in 1957 as a Research Associate in Comparative and Physiological Psychology and joined the Institute of Vision of 1960. Except for short periods at the Britannica Center in Palo Alto, California, and at the Enzyme Institute at the University of Wisconsin he remained in the Institute of Vision until Biophysics was formalized.

The reorganization of the University took the Department of Agricultural Biochemistry out of the College of Agriculture and Home Economics and placed it in the College of Biological Sciences as the Academic Faculty of

Biochemistry and Molecular Biology with essentially the same goals and the same program it had always had. The name had changed and almost a decade of orderly and meaningful progress had been denied it. The Department of Physiological Chemistry remained and even the Department of Chemistry embarked on its own biochemistry program. Two staff members and a course Biochemistry 661 5 credit hours were added in that Department. Those involved with reorganization proposed that the three groups maintain three different budgetary and college loyalties and have a common chairman. This was supposed to guarantee interdepartmental cooperation. But realizing that no man could serve three deans, the three Departments - Chemistry, Physiological Chemistry and Biochemistry unanimously agreed to oppose such administrative illegitimacy. The only areas of interdepartmental cooperation agreed to by the three departments were: that only one three quarter sequence in general biochemistry to support graduate study in biochemistry would be taught with a committee approach for the lecture portions wherein professors of the three departments would share teaching responsibility; that the departments would attempt to pool and share all applicants from prospective graduate students seeking stipends; that each department should in its own way serve the special service requirements of their respective colleges, and that biochemistry be presented to the undergraduate in a positive integrated manner by the Academic Faculty of Biochemistry and Molecular Biology and open to all undergraduates of the University. Indeed these are the very areas of cooperation the Department of Agricultural Biochemistry had tried to bring about for many years only to be rejected for a multiplicity of provincialities already discussed in this history. How tragic! After all the blood letting, intellectual snobbery, sniping, lack of vision, costly dislocations of staff; etc., the situation for biochemistry on the campus has changed relatively little organizationally in the University.

It is true that, finally, the old 30 hour rule and other artificial barriers to the undergraduate interested in biochemistry have been lifted. Whereas five years ago there were only a very few undergraduate majors, now there are at least 60-70 majors and the enrollments in biochemistry courses has increased markedly.

But the University itself, and biochemistry in the University had lost in the last 15-20 years truly fabulous opportunities for growth and service to the University and its students. They had muffed the opportunity to become comparable with their sister institutions. That there was any growth in this period is due to the loyalty and perseverence of a few. President David D. Henry of the University of Illinois some years ago in a plea to the legislature of that state admonished the lawmakers to remember that the nature and purpose of any university was such that if a fundamental need exists and is not met at the opportune time progress would be delayed at least ten years for each year the need was left wanting. And it is so true for this Academic Faculty and the Ohio State University! We at OSU still suffer from the tardily met needs of its founding years - 30 years were required to get continuing legislative support. Much of the delay was due to lack of

vision, as to what the "industrial university" of Professor Jonathan Baldwin Turner - the comprehensive university - should be. The lack of vision and concomitant deficiency of leadership was not a monopoly of legislators but university professors and administrators as well must share the blame. For biochemistry opportunities were lost a plenty. After World War II biochemistry truly became of age. Its role in the development of all areas of basic and applied biology was finally and generally realized. Fantastic advances in medicine and agriculture - the two very practical areas of applied biology - were in a large measure due to the discipline of biochemistry and its fundamental nature and this was even understood by the non-scienctist - the layman. Government agencies, private foundations, and industry were underwriting growth in biochemistry by financing professors and students research, and buildings, and equipment for teaching and research in biochemistry, and by subsidizing students to go into the area. The big push in biochemistry produced results in biochemistry across the nation, but alas the Ohio State University benefited very little because of its petty preoccupations. It's unhealthy academic climate encouraged some potential scholars to leave OSU, deterred many potential scholars from coming to OSU, and discouraged many funding agencies from helping the University and its struggling loyal biochemistry professors. How ironic! The spark to finally overcome the lethargy and opposition to get the Ohio State University on its way was struck by an articulate lawyer who wrote for all people of the state in 1870 that Ohio had no true universities for Ohio had no intellectuals of higher order because "most professors of our literary institutions are ... not infrequently narrow minded politicians". (p. 23) One might wonder what Mr. Ralph Leete might say today on studying this history. Might he conclude that the institution he was so active in founding had hamstrung its own developments by its own narrow and conservative academic "liberalism"? Might he wonder if many aspects of current student unrest throughout the nation might be due to too much attention in the University to the limited desires of faculty and administrators and the resultant separation of students from their teachers; and due to making decisions by not what is best for the student but what is best for the faculty or what is best for the computer?

How unfortunate that Ohio had no enterprising educator, such as Professor Turner, knowledgeable in the limited horizons of the classical conversative "liberal" professors, to chart the beginnings of its State University, to blunt the opposition of the "liberal" church colleges and others who prevented a healthy start, and to assure that the new University would have the proper foundations to support the comprehensive university of today. But as one follows the 86 year history of this Academic Faculty of Biochemistry and Molecular Biology, it is clear that many devoted scholars have given their lives to build this University. At the same time the conclusion is inescapable that the financial support of the University by the State has generally been weak and more academic statesmen of unquestioned vision, integrity, and impartiality could have nurtured the growth of biochemistry more effectively. And what has been true for this Academic Faculty is likely also true of many other divisions in this good University. May the lessons of its first century guide

the entire university into new heights of excellence among its peers and of service to its students. The evidence of the last century shows that academic snobbery has been and is likely to be around for a long time to come. Then too, generally, university professors consider themselves liberal (with everyone else's fields of interest) but are in reality ultraconservative in their own educational philosophies and specialties. Also professors are continually exposed to the insidious hazard, so characteristically discribed by the late Mr. Charles F. Kettering, eminent alumnus, trustee and benefactor of the University, that specialization may often be used as an escape from responsibility. So, if we professors and adminstrators alike, in the University will recognize the limited vision ever present in liberal academic conservatism or conservative academic liberalism, progress will become easier and more meaningful as all of us try to make this comprehensive university a center of excellence and of service to the public generally, to the state of Ohio, and, above all, to its students.

Universities are known for the quality of their product, their students. The educational programs to serve the students must come from imaginative and enterprising professors who can accept and execute their individual responsibilities. They, in turn, must be supported and encouraged by enterprising boards of trustees, presidents, deans, and chairmen as these administrators strive to develop and maintain the conditions for the professors to be most creative in their own fields and in their contributions to their students. In this way professors will realize their own professional goals among their peers as well as their students. Likewise for administrators. Mutual respect among students, professors and administrators will then be realized. And a new era of progress and good feeling will be assured for not only this Academic Faculty of Biochemistry and Molecular Biology but for all in The Ohio State University.

Appendices

Appendix A

Documents Submitted to the Council on Instruction
1961 - 1962

A PROPOSAL TO CHANGE THE NAME OF THE DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY TO THE DEPARTMENT OF BIOCHEMISTRY*

The history of The Ohio State University is perhaps more closely linked to the Department of Agricultural Biochemistry than to any other department of this great University. It is interesting to note among the very first departments to be established in this University was a Department of Agricultural Chemistry. Its first professor, later chairman of this department, was Professor Henry Adam Weber. Professor Weber was a student of Liebig, the great German scientist of the last century who devoted his entire life to laying the foundations of modern biochemistry. Professor Weber was succeeded by Dean Alfred Vivian who came to this campus from the University of Wisconsin where he had been a student of the renowned Babcock. Dr. Babcock was one of the great scientists and teachers of his time and it was in his honor that Babcock Hall, the Biochemistry Building at the University of Wisconsin, was named. The University of Wisconsin is, today, one of the most productive and highly renowned departments of biochemistry in the world.

When Professor Vivian was named Dean of the College of Agriculture he was succeeded as Chairman of the Department of Agricultural Biochemistry by Professor John F. Lyman, a student of the famous Professor Lafayette B. Mendel of Yale, whose place in American development of biochemistry and nutrition has perhaps no equal. Professor Lyman was succeeded by Dr. T. S. Sutton, now Associate Dean of the College of Agriculture and Home Economics, who in turn was succeeded by Dr. F. E. Deatherage, the incumbent chairman of the department.

All of the men who have been Chairman of the Department of Agricultural Biochemistry or, as it was known previously, Agricultural Chemistry, were trained as biochemists. They were all trained in departments of biochemistry in different universities and all of the faculty members of this department have been trained biochemists. Thus, the staff and administration of the Department of Agricultural Biochemistry is and always has been the staff of a biochemistry department.

It was in 1947, quite a number of years after many similar university departmentshad changed their names to simply "Biochemistry", that a request

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* Presented to the Council on Instruction, The Ohio State University, December 11, 1961 by Dr. Fred E. Deatherage, Chairman of the Department of Agricultural Biochemistry, and Dr. Roy M. Kottman, Dean of the College of Agriculture and Home Economics.

was made to change the classical name of this department from "Agricultural Chemistry" (as it was known in almost all land-grant colleges in their early years) to the Department of Biochemistry. Unfortunately, the name was not changed as requested, but it was changed instead to "Agricultural Biochemistry", which was a name that reflected the transitory name used by some institutions prior to the time that they adopted the more appropriate name "Biochemistry". The name "Agricultural Biochemistry" has been discarded by almost all institutions of higher education because people unfamiliar with the evolution of biochemistry in the United States have tended to put more emphasis on the adjective than on the noun, thus obscuring fundamental nature of the science and leading to misunderstanding of the true function of the departments so named.

Biochemistry at The Ohio State University showed excellent growth under the guidance of Professor Lyman and Professor Vivian during the 1920's, but became, in a manner of speaking, a victim of the economic collapse of the 1930's. (See Table 1.) Whether it was the continuation of a departmental name which did not fully describe the total effort of the department or whether this was only one of several reasons, not the least of which was inadequate financial support, biochemistry at The Ohio State University did not flourish as it should have during the decade following World War II. More recently it has become apparent that if That Ohio State University is to have an up-to-date biochemistry group, educational research in biochemistry must be substantially expanded, because biochemistry is essentially a graduate subject. During the past ten years when there has been only very limited state support for research at the University, it has been necessary to obtain outside grants to support the research program in Agricultural Biochemistry and to enable the department to attract high quality students. Many of these students come to the University from smaller liberal arts colleges rather than from undergraduate curricula in other large universities. Since the smaller colleges are the major source of graduate students for this department and will likely continue to be so in the future, it becomes even more important for the department to change its name simply to "Biochemistry".

There is considerable history involved in this application to the Council on Instruction for changing the name of the Department of Agricultural Biochemistry. Ever since the founding of The Ohio State University this department and its antecedent "Agricultural Chemistry" has centered its academic program in the chemistry of living things -- biochemistry! For over fifty years, the anchor course for its graduate program has been known as General Biological Chemistry. The department's graduate program antedates the establishment of The Ohio State University Graduate School. Ph.D.'s have been earned in this department for almost a half century. These historical, as well as the more urgent, considerations of an evolving science led to the compilation of a report made to the Council on Instruction in 1954, entitled "The Instructional Program in Bio-

chemistry at The Ohio State University and Suggestions Regarding Its Improvement." In this report it was requested, as had been done previously in 1947, that the department name be changed to "Department of Biochemistry". Other portions of the report dealt with proposals for strengthening the academic program of the department. The 1954 report and the appended documents are no doubt available for detailed study in the Council's files.

TABLE 1

GRADUATE DEGREES EARNED

	M.S.	Ph.D.
1910-14	7	0
1915-19	9	2
1920-24	9	0
1925-29	10	10
1930-34	20	5
1935-39	10	3
1940-44	9	6
1945-49	10	10
1950-54	11	19
1955-59	16	21
1960-	3	6
	—	—
	114	82

The 1954 request to the Council was denied. It was followed by requests in 1955, 1956, 1957, and again in 1958 when the Council advised that the department's request had been tabled and suggested that the department refrain from activity at least for a year. In consequence of this admonition, no action was taken to initiate a name change in 1959 or in 1960.

It is believed appropriate to once again open the subject of a name change for the Department of Agricultural Biochemistry. The realities of scientific development in the field of biochemistry and urgency of our gaining strength throughout all of the life sciences on this campus makes it seem imperative that the case for a name change be stated just as honestly and just as strongly as we can possibly present it. The importance of biochemistry and its role in agriculture and medicine are clearly defined by Dr. Detlev Bronk, President of the Rockefeller Institute and the National Academy of Sciences, who addressed the first of a series of lectures

commemorating the 50th anniversary of The Ohio State University Graduate School.

In spite of the difficulties which have come to the department by virtue of its having to function with a name which inadequately describes its work, the teaching program has been continually upgraded so that the department now has what is recognized by biochemists throughout the nation, as a sound, though extremely limited (due to a small faculty) program in biochemistry. The evolution of our academic program was carried on while attempting to work out among other interested groups in the University some measure of unanimity in the thinking of what a graduate program in biochemistry should be.

It was particularly discouraging to the staff of the department and to many people on the campus genuinely interested in the development of biochemistry when in 1958 the adjective "agricultural" was inserted before the word "biochemistry" wherever it appeared in bulletins of the University, thus contriverting the meaning of the subsequent course descriptions. The use of the term "agricultural" indicates the chemistry of fertilizers, pesticides, herbicides, and other direct application of chemistry to problems in agricultural crop production. While the department is genuinely interested in the whole range of problems of biochemistry incident to agriculture and medicine, the real and abiding interest of today's biochemist, is in fact, in the chemistry of life processes!

Our interest in again proposing to the Council on Instruction that the name of the Department of Agricultural Biochemistry be changed to "Biochemistry" is the same interest that the Council has in all of its deliberation, namely, to insure growth of the academic program of this University -- growth in quality as well as in quantity; growth in stature among its peers; and growth in service to Ohio and to the nation. It is believed that the name change proposed will make this type of growth more easily possible of achievement. It is realized that as we grow in these various ways good students will attract other good students; a good faculty will attract other good faculty; and that similarly a good faculty will attract additional good students and they in turn an even better faculty -- a chain reaction which all of us in our own way must, with our best efforts, provide the energy and clear the way for the reaction to take place. This proposal is being made to the Council on Instruction because we as administrators feel a deep responsibility for an improved and continually improving educational program in biochemistry. We would be doing less than our duties if we did not make clear to the University administrators our concern for the future of our program should we be compelled to continue operating under a name which is essentially inaccurate in its connotation.

It is believed that a brief resumé of the development of biochemistry as a science is important to the presentation of this proposal. Even a cursory survey of the history of science will show that the early forebears of modern science recognized that biological systems were dynamic chemical systems. daVinci, Lavoisier, Priestly and many others were much interested in this concept, but the basic principles on which a sound development of chemistry, let alone biochemistry, could be based were yet to be established when these men were pursuing their careers.

It was the synthesis of urea by Wohler early in the 19th century that really unlocked the door for modern biochemistry. It unfolded a whole new philosophy on what chemistry could contribute to the understanding of biology. Liebig and Pasteur probably more than any others, laid the foundations for modern biochemistry even before the basic principles of chemistry necessary to support biochemistry were established. During his first 40 years as a working scientist, Pasteur made many basic and notable contributions in the chemistry of living organisms. In later life he laid the basis for the science of bacteriology. All of his work shows the influence of the discipline of chemistry.

Liebig devoted his whole life in laying the ground work of biochemistry and applying chemistry to agricultural problems. Indeed, it was he who succeeded in convincing governments that they should support higher education and research. As we celebrate the centennial of the land-grant movement in this country, we might well pause in respect to this great man of vision who succeeded in espousing the philosophy on which our own institution is based. So strong was his influence that any early land-grant college which wanted to amount to something attempted to hire a student of Liebig as its first professor of chemistry. Such was the case at Ohio State University, for Professor Henry A. Weber was the first professor of agricultural chemistry and instituted laboratory instruction in beginning chemistry courses in this institution. There is in the Department of Agricultural Biochemistry's offices a burette made by Professor Weber during the time that he was a student in Liebig's laboratory more than a century ago.

At The Ohio State University, as in other land-grant institutions, agricultural chemistry departments begot departments of soils, agronomy, nutrition, etc., and they evolved into modern departments of biochemistry, never losing sight of the basic concept - the chemistry of living things! The application of chemistry to agriculture was parallelled in the application of the same principles to other major areas of applied biology - medicine! It is understandable that there has been developed something of a dichotomy in biochemistry with departments springing up both in the Colleges of Agriculture and Medicine. We would not argue that this is or has been bad. We would argue that in one or the other of these colleges there should be developed along with applications of biochemistry a strong program in fundamental studies involving the chemistry of life. It might even be developed in both

areas to the great advantage of the University which would perceive the merit of such a development. In any event, neither such department should be deprived of the name "biochemistry" for then a variety of interdepartmental programs and policies might well be developed.

A part of the difficulty which has beset departments of biochemistry has arisen out of the antipathy developed in past decades on the part of those chemists who were interested primarily in inorganic, analytical, physical and organic chemistry. In the early days of modern science these areas were much more amenable to study and it has not been until relatively recent years that biochemistry has come into its own. As a consequence, biochemistry has been left outside of chemistry departments in most universities. In spite of such a situation, biochemists were using the same chemical principles to study biological systems and they were feeding back to the organic and physical chemists as many basic contributions to their fields as they were receiving from them. During all of these decades when physics, chemistry and mathematics were evolving rapidly, biology was being developed on a morphological rather than a quantitative base. This has led to the "two cultures" that are somewhat apparent in present day biology as recently described in Science by Professor (of Biology) Garrett Hardin of the University of California. He expresses great concern for the divergence of the new knowledge being developed by the molecular approach to biological problems and the classical education of biologists which has until very recently been based almost entirely along the traditional morphological lines. Here, at The Ohio State University, it is extremely important that the climate be made conducive to bridging the gap between the classical approach to the education of biologists and the modern molecular approach which interweaves physical and biological sciences with the classical approach. The educational challenge and responsibility of biochemistry in this area cannot be underestimated.

The volume of publications in chemistry indicates that biochemistry is today far the most active of all the branches of chemistry. This is understandable because of the disciplines and principles of biochemistry are applicable to almost all branches of biology and to chemistry as well; a biochemist must be a biologist as well as a chemist. It is for that reason that a biochemistry department cannot limit itself to the professional training of biochemists. By the very nature of the field, a biochemistry department must serve a university-wide general education function. To encompass these responsibilities will require a much larger department unhampered by a name no longer appropriate to its function.

Biochemistry itself is essentially a graduate subject. A student is not able to get significant education in biochemistry in four years of undergraduate study because he must first get the basic chemistry, physics, mathematics, and biology along with the social sciences and humanities and all of these studies will consume the four years available for undergraduate work. Most graduate students entering biochemistry come from the smaller liberal arts

colleges where they have studied chemistry or biology. The Department of Agricultural Biochemistry offers a curriculum for undergraduates at Ohio State. This curriculum does not encourage a student to take very much biochemistry as an undergraduate and is largely counseling and advisory to the student aspiring to graduate work or a scientific career. Four years in the program opens up the scientific horizons for students so that they can go with relative ease into any branch of chemistry as well as into biochemistry or into any branch of biology, whether fundamental or applied, and whether oriented to agriculture or medicine. The graduates of our program have done exceedingly well as graduate students or medical students. The program is attractive to the science-oriented student who does not know at the beginning of his college career what field of chemistry or biology interests him most. The appeal of this curriculum has been more in terms of curiosity than in terms of enrollment by students at this University. Again, we believe that this is influenced somewhat by the name of the department. This view is substantiated by the fact that, within the past year, the department has received over 2,000 requests from high schools and colleges all over the country for copies of this undergraduate program.

At the present time the courses offered in the Department of Agricultural Biochemistry are designed to serve three groups of students -- those who wish a descriptive treatment of biochemistry to round out their educational programs; those who are going into a profession which requires some knowledge of biochemistry; and those who wish to become proficient to the place that the quantitative disciplines occupy a primary position in their education. This last group includes graduate students majoring the biochemistry or some field of chemistry or biology closely related to it.

Through an orderly process of course development over the past few years, the department now has courses which satisifies the demands of students throughout the entire University. Students coming into these courses represent a wide variety of curricula from elementary education to engineering.

Because biochemistry fits into curricular programs essentially at the graduate level, research is of primary importance to the development of a strong department. This means relatively few courses at the graduate level with more time for individual study, individual research and seminar participation. It means also that each faculty member must have a research program which serves an educational function in the overall program of the department. Careful staff selection in recent years has resulted in each staff member's research interest being oriented toward the biochemistry of some fundamental biological problem. Presently the staff of the Department of Agricultural Biochemistry is working on cell membrane metabolism; the biochemistry of spore formation; cellular differentiation and feedback control mechanisms; hormonal control of enzyme systems; the biochemistry of adipose tissue; liver regeneration; the mechanism of action of antibiotics; biosynthesis of cyanogenic glycosides; the biochemical bases of quality in

meat; the biochemistry of the reticulo-endothelial system; and non-specific immunity. These research programs involve use of microorganisms, higher plants and animals. Students in the department are aware that the major concepts of biochemistry are applicable to all biological systems. One difficulty hampers the educational program of the department - - a small staff cannot give graduate students the breadth of training which is needed in biochemistry.

The present departmental cost of education and research for each graduate student over and above faculty salaries is approximately $10,000 per student annually. This is somewhat similar to other institutions offering biochemistry and it makes little difference whether the students involved are highly capable or only average. It is cheaper to educate very good students in comparison to the average. The department has used great care in selecting students because of the limited research budget and the high cost of graduate student education. Since the University has only a limited research budget, none of which a department can count on regularly, this department has had to rely on grants from outside agencies to support the strong graduate program which has characterized the department in recent years. These funds have provided equipment, supplies, graduate student stipends, travel for staff and students, and many other necessary outlays. Research equipment has been used to support classroom teaching as well as research. It has been necessary to utilize the great majority of the department's financial support for staff salaries in order to compete with other institutions for high quality staff. Because of its high standards, its aspirations and the tremendous drive of its staff members, there has been much effort made to secure outside research support both for staff members and their students. This has placed an additional burden on the staff over and above their teaching responsibilities.

It is believed that the needs of biochemistry at The Ohio State University are larger than anyone who has not given considerable thought to the matter, would ever guess. Since the Department of Biochemistry should serve a university-wide function -- not merely a service of the Colleges of Agriculture and Home Economics, Veterinary Medicine or Medicine, it is essential that plans for the future match the rapidly increasing stature of this great University. In keeping with the philosophy that The Ohio State University should be second to none in a field so important to its future as is biochemistry, the following recommendations are made for consideration of the Council on Instruction:

1. The name of the Department of Agricultural Biochemistry be changed to "Biochemistry". This will improve departmental relationships within the University and outside institutions and particularly with prospective students who are not aware of the history of biochemistry or of the historical background of this

University's organization. Furthermore, this change would, it is believed, facilitate attracting funds to the University and would demonstrate dynamic thinking of the faculty of this University.

2. The program in biochemistry at The Ohio State University should be a broadly integrated academic program.

3. The program should serve the following groups:
   a. Graduate biochemistry majors
   b. Graduate students in related areas
   c. Professional students in dentistry, veterinary medicine, and possibly medicine
   d. Undergraduate students in agriculture, education, home economics, arts, commerce and engineering.

4. The faculty required to implement a program of top-notch stature is estimated to be 22 staff members. This number would be barely equivalent to that found in other institutions of comparable size and with comparable educational programs. Faculty members must be selected so that their research interests will support the needs of the overall program so that a reasonable balance of work involving microorganisms, higher plants, animals, and viruses can be maintained. Biochemistry should be the integrating force for many areas of biology and chemistry.

5. The physical facilities for biochemistry should be centrally located in respect to the departments in the Colleges of Agriculture and Home Economics and of Medicine and Veterinary Medicine. 138,000 sq. ft. of floor space will be required to adequately furnish the space needed by the department. The buildings and equipment required are estimated to cost $4,100,000. These facilities and the staff which would man them would put The Ohio State University on a par with other universities which are leading in the field of biochemistry.

Table 2 below shows membership in the American Society of Biological Chemists. Membership in this organization is by invitation only. A comparison of the 1957 figures with those of 1961 would indicate that a gigantic effort must be made in the area of biochemistry by The Ohio State University.

The era of biochemistry or molecular biology, as it is often called, is here. The Ohio State University must be concerned about its posture in this important area of academic endeavor. The present staff of the Department of Agricultural Biochemistry is working hard to bring to The Ohio State University a top quality biochemistry program. This they have had to do from grant funds to support their educational research efforts. Our small group in the department has through the quality of its educational program

TABLE 2

MEMBERSHIP IN THE AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS IN SELECTED UNIVERSITIES IN 1961 COMPARED WITH 1957 AND 1963*

	1961		1963*		1957	
California		60		63		49
Berkeley	41		40		47	
San Francisco	12		10			
Davis	7		13		2	
Harvard		48		52		44
Wisconsin		47		50		45
Illinois		28		32		23
Michigan		27		28		14
Western Reserve		27		24		18
Chicago		26		25		26
Minnesota		25		26		26
Purdue and Indiana		22		23		16
Purdue	11		13		10	
Indiana	11		10		6	
Iowa and Iowa State		15		16		16
Iowa	10		12		11	
Iowa State	5		4		5	
Cincinnati		11		6		9
Michigan State		10		10		6
O.S.U. and Ohio						
Agr. Expt. Sta.		9		12		7
Columbus	7		**10		5	
Wooster	2		2		2	
Northwestern		8		9		8

* 1963 data added for this history by the author as it had been requested later.

** Chem. 1
Ag. Bio. 6
Physiol. Ch. 2
Path. 1

brought to the University over $800,000 in support of its program in research and education over the last five years.

These funds have come from the Rockefeller, Kettering and Frasch Foundations; Harvard University, National Academy of Sciences -- National Research Council, as well as from the Research Corporation, National Science Foundation, National Institutes of Health, and other groups. Of particular and significant interest to the Council of Instruction is that the department received the first basic science training grant from federal sources ever given to The Ohio State University - - a grant specifically to suport graduate and postdoctoral education in biochemistry. To qualify the academic program must be sound, the educational research imaginative, the facilities adequate, and the staff competent. Who decides whether or not an application for such a grant is approved -- a committee of leading biochemists of the country -- our peers.

The Chairman of the Department of Agricultural Biochemistry has represented the American Society of Biological Chemists in the Division of Biology and Agriculture of the National Academy of Science -- National Research Council for the last three years. He was recently named to this position for three additional years. The Chairman is also just beginning a term as a member of the committee to evaluate applications for Fulbright and other foreign assignments. Both the Chairman and Professor R.O. Moore of the department are on National Science Foundation fellowship committees. These activities make them acutely aware of the educational movements in biochemistry throughout the United States. The present educational program of the department, when compared with a recent report of the Educational Affairs Committee of the American Society of Biological Chemists, indicates that the Department of Agricultural Biochemistry at The Ohio State University has done well in developing its educational program in spite of handicaps greater than those encountered by similar departments at other institutions.

As further evidence of the need for a name change for the department, we cite the negotiations which took place when the training grant was being negotiated. There were conferences, both on the campus and in Washington, D.C. A group of eminent biochemists visited the campus. The question asked over and over again concerned the possibility of changing the name of the department. Several of the panel members studying the department's program volunteered that unless the department were to be more properly identified, growth would be more difficult.

Through hard work and devotion to the program of the department, the relatively small number of faculty members has developed into the nucleus of a strong biochemistry program which has been recognized by peers of these staff members outside of our own University. The program has been recognized as a program which is among the very best in the country.

TABLE 3

SUMMARY OF GRANTS MADE TO THE DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY 1951-1961

Wm. Kenan, Jr., Nutrition, av. an. grant of $1000, 1936-1960	$ 25,000
Nestle Co., Chemistry of Coffee, 1950-1952	8,000
Herman Frasch Foundation, Proteins, 1952-1962	90,000
Coffee Brewing Institute, Chemistry of Coffee, 1954-1958	24,000
*Kingan and Co., Biochemistry of Meat, 1952-1955	25,000
*U.S.D.A., Bruised Tissue (with Vet. Path. and An. Sci.)	27,000
*American Cyanamid Co., Antibiotics, 1954-1958	20,000
Kingan and Co., Fellowship, 1954-1956	10,000
Kettering Foundation, Photosynthesis, 1952-1954	5,000
Kettering Foundation, grant for staff leave, 1954	7,000
Kettering Foundation, Proteins, 1955	2,000
Kettering Foundation, Fellowships, 1953-1961, 3/year at present	55,000
Kettering Foundation, Cooperative Fellowship, 1960-, 3/yr at present	10,000
Kettering Foundation, Biochemistry Capital Equipment, 1960-61	15,000
Harvard University, Visiting Lectureship, 1959-1960, 1961	13,000
National Science Foundation, Faculty Fellowship to Cambridge Univ. 1959-1960	13,000
National Science Foundation, College Teacher Res. Part., 1960-61	23,000
National Science Foundation, Capital Equipment	25,000
National Science Foundation, Proteins, 1959-1961	20,000
National Science Foundation, Cyanogenic Glycosides, 1958-1961	19,000
National Science Foundation, Spore Formation, 1960-1962	13,000
*Parker Tobacco Co., Aging of Cells, 1958	2,500
Department of Defense, Q.M. Food, Meat Proteins, 1955-1959	81,000
Department of Defense, Surgeon General, Enzymes, 1958-1961	45,600
Research Corporation, Nitrate Reduction, 1955-1958	5,000
Rockefeller Foundation, 1954-1958	25,000
Atomic Energy Commission, Teaching Equipment, 1958-1961	8,000
National Academy of Sciences, National Research Council, support for visiting faculty member, Biochemistry of Rice Plant	14,000
National Institutes of Health, Nucleic Acids, 1959-1961	17,500
National Institutes of Health, Aging Cells, 1958-1961	8,000
National Institutes of Health, Spore Formation, 1960-1963	37,000
National Institutes of Health, Oligosaccharides, 1960-1963	40,500
National Institutes of Health, Hormonal Regulation, 1960-1963	44,700
National Institutes of Health, Biochemistry Training Grant, 1960-65 (First one at O.S.U.)	124,700
Ohio State University Development Fund and Council on Research	35,000
TOTAL	938,900
Previous to 1956	138,500
Last five years	$ 800,400

Additional direct fellowship support to graduate students 1957-1961:

U.S. Public Health Service Fellowships	5 fellowship years
National Science Foundation Fellowships	5 fellowship years
Mershon Fellowship	1 fellowship year

* Placed at Ohio Agricultural Experiment Station

In this request, as in previous requests, we have presented evidence to substantiate the following points:

1. The Ohio State University has not developed a program of sufficient breadth and of sufficient size to meet the needs of all of the other biological educational activities on The Ohio State University campus.

2. The Department of Agricultural Biochemistry has developed a sound program in general biochemistry and its academic program has been historically, and is now, biochemistry rather than biochemistry specifically applied to any field of endeavor. See Tables 4 and 5.

3. The present name of the department does not represent its program or its potential function in this University.

4. The present name is misunderstood on The Ohio State University campus.

5. The present name leads to misinterpretation by off-campus persons.

6. The proposed change in name would not encroach on the domain or function of any other department in the University.

We have reason to believe that there is much misunderstanding among staff members of this University concerning the work of the Department of Agricultural Biochemistry in teaching and in research. We believe that most staff members would conclude that the work of the department has to do with analysis of fertilizers, insecticides, soils and feeds. Unless a faculty member has had direct personal contact, he would be quite justified in assuming these activities as the complete total sum of activities of the department. Recently Professor Moore of the Department of Agricultural Biochemistry, in a visit to Miami University, met a young man interested in graduate work in biochemistry. On his own, this young man had come to The Ohio State University campus and inquired at the Graduate School office about biochemistry and was told by someone in that office that the

University had no Department of Biochemistry. Upon further questioning, he was told that the closest thing to his interest was in another department which, he visited and found, was not at all what he was looking for. It goes without saying that we did not enroll this man as a graduate student at The Ohio State University. Within the past few weeks we got a similar report from a student from Ohio Wesleyan. We're concerned lest others are being turned away in just such an inadvertent fashion.

We can take another example from the Entrance Board of this institution which has, in the past on a number of occasions, refused or held up admission to prospective graduate students because they were not graduates of a college of agriculture. Such instances have come to our attention even though we have repeatedly tried to correct the situation. This happens because some of the personnel who handle mail simply cannot comprehend why a graduate student in agricultural biochemistry should not have a bachelor of science degree in agriculture. A most vivid example of this was a 3.7 honors graduate of Johns Hopkins who had heard of some of the work in our department and who had applied for admission as a graduate student. After much delay, it came to the attention of the department that this man's qualifications were being questioned because he was not enrolled in a college of agriculture. This is another student that we did not get enrolled.

Off-campus the current departmental name is a double handicap -- in attracting top quality graduate students and of obtaining funds. The staff of the department has had occasion to visit a number of college campuses to encourage students to enroll as graduate students in the department. During the past few months over twenty such schools have been visited. At every such institution, it has been the same. Talking with both faculty and with students, it has been necessary to spend a large amount of time trying to explain the name Agricultural Biochemistry when the department deals in basic biochemistry and not in analysis of fertilizers, feeds and the like. This is understandably a frustrating experience which would not happen if the department were properly identified for what it is and always has been. (Table 4 gives the journals where the research of the department has been published and Table 5 gives the present occupations of those earning Ph.D.'s in the department.)

Realistically, we must accept the fact that we are not making the most of our opportunities simply because of the name of the department. Another example of what has happened is that a foundation recently sent representatives to investigate a request that had been made on behalf of two staff members. The visitors to our campus were quite outspoken in stating that the department should change its name. They were impressed with the department's program and with the research proposal. When the proposal was finally disapproved there were in the letter of notification these statements: "I cannot help but wonder whether that point (department name) I brought up with you...played a part here...there may be a tendency (among our Advisory Committee) to be dubious of the viability there of a program of truly basic biochemistry. I myself know... that you have done everything to

TABLE 4

JOURNALS IN WHICH RESEARCH OF GRADUATE STUDENTS AND STAFF WAS PUBLISHED FROM 1954-1961

	Number of papers
Archives of Biochemistry and Biophysics	28
Federation Proceedings	11
Journal of Animal Science	9
Food Research	9
Journal of the American Chemical Society	8
Food Technology	7
Applied Microbiology	6
American Journal of Bacteriology	5
Agricultural and Food Chemistry	5
Journal of Biological Chemistry	4
Nature	4
Biochemical and Biophysical Research Communications	3
Antibiotics and Chemotherapy	3
Journal of Experimental Cell Research	3
Journal of the American Oil Chemists Society	3
Bulletins of the Ohio Agricultural Experiment Station	3
Proceedings of the American Chemical Society	3
Antibiotics Annual	3
Annals of the New York Academy of Sciences	3
Journal of Nutrition	3
Acta Histochemica	2
Surgery	2
Proceedings of the Society of Biology and Medicine	2
Methods in Enzymology	2
Analytical Chemistry	1
Proceedings of the First International Congress on Antibiotics	1
Endocrinology	1
Ohio Journal of Science	1
Surgical Forum	1
Archives of Surgery	1
Journal of the American Gastroenterological Association	1
Journal of American Public Health Association	1
Science	1
Journal of Experimental Botany	1
Chemistry and Industry	1
United States Patent	1
Proceedings of the American Meat Institute	1

TABLE 5

PRESENT OCCUPATIONS OF PERSONS RECEIVING Ph. D. s THROUGH THE DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY 1940-1961 inc.

	Number
Professors of Chemistry	13
Professors of Biochemistry	8
Professors of Nutrition or Food Sciences	6
Research in Pharmaceutical Industry	5
Research Associates in Medical Schools	5
Research in Food Industry	4
Research in Chemical Industry	4
Biochemical Research, Research Institutes	4
Government Research Institutes	5
Postdoctoral Fellows	2
Scientific Editors	2
Director of Market Research, Chemical Industry	1
Director of Research, Food Industry	1
Professor of Internal Medicine	1
Assistant Professor of Pediatrics	1

foster an environment in which fundamental, modern approaches to biochemistry, both in teaching and research can flourish..."

When a department within a university has a name which does not portray the program or function of the department, the faculty members of the department operate under a very real handicap in getting outside support. Even though the faculty shows vigor and imagination in teaching and research in biochemistry, outside agencies are skeptical about placing their dollars where they could be criticized because of misunderstanding due to the name of the department.

Biochemistry needs centrally located facilities and it needs a much larger staff. This will require greatly increased funds. It is not impossible that outside help can be secured for at least a part of the cost of the $4,100,000 building which is proposed. It would be most difficult to secure that help if the department were to continue with its present name. With a name which accurately describes the department and its work and with the evidence that The Ohio State University has a strong program of biochemistry and is willing to encourage growth of this program, it is likely that the capital needed can be more easily obtained. Currently there is money for sound and imaginative research in biochemistry. Biochemistry is popular; its potential in the growth of knowledge for the good of man is being generally recognized and we are on the threshold of untold miracles in the coming age of modern biology through biochemistry. We will do less than well by our University and by our citizens if we do not strike vigorously to make the most of this opportunity.

President Henry of the University of Illinois made a statement in a plea to his legislature in Illinois some years ago. It is appropriate here: "When a need is delayed a year, progress is generally delayed a decade."

We believe it is logical that you ask these questions: "Is this request reasonable?" "What do other schools do?", etc. To answer these and other questions, the following facts are pertinent:

1. Biochemistry did not grow up in departments of chemistry generally. Of 123 departments of chemistry in the U.S.A. which offer Ph.D.s only 55 claim to have a program in biochemistry and in a relatively few of these 55 does biochemistry hold emphasis equal to other branches of chemistry. There are 82 departments of biochemistry giving Ph.D.s in addition to the 55 chemistry departments.

2. Early biochemistry programs developed usually in land-grant institutions through colleges of agriculture. Medical departments of biochemistry came later. In our own institution whereas the department we represent was the first established in the University, our counterpart in the College of Medicine was not formed until 1921.

3. Medical school biochemistry groups rarely serve a university-wide educational function. The Department of Biochemistry at the University of Michigan, College of Medicine, is the only one which serves an entire large university. They do it well. Michigan is not a land-grant institution and the Medical School has had tradition, not common in most universities, of serving the university-wide function in some basic science areas.

4. Medical departments of biochemistry carry only a relatively minor load in the graduate training of biochemists. Of the 82 departments of biochemistry 60 are now in medical schools and 22 are not. Yet these 60 departments account for only about 1/4 to 1/3 of the total Ph.D.s in biochemistry, and less than 1/2 of those given by biochemistry departments. Non-medical biochemistry departments graduate about 4.2 Ph.D.s per year per department whereas medical biochemistry groups average only 1.2 per year.

5. The use of the adjective "agricultural" in relation to biochemistry departments is becoming extinct because it is recognized that biochemistry is applicable to any biological area -- medically as well as agriculturally oriented. Of the 82 biochemistry groups, only 4 are known as agricultural chemistry or agricultural biochemistry. Three others have combined names such as Agricultural Chemistry and Biochemistry, or Agricultural and Biological Chemistry. In these states these departments usually have a service function to the state in the way of feed and fertilizer control, such as is done in Reynoldsburg by the Ohio Department of Agriculture. In these instances it is reasonable to expect such names, but in our instance you can readily see that our name is truly an antiquated misnomer. Quite in contrast is the use of the term physiological chemistry. This is used by at least 8 medical schools.

6. Biochemistry is the most active branch of chemistry in educational institutions. In the 1959 American Chemical Society Directory of Graduate Education, from where all of the above data came, 123 departments of chemistry, including the 55 giving biochemistry, use 446 pages. These departments offer mainly degree programs in inorganic, analytical, organic, physical and biochemistry. The 82 additional departments of biochemistry require 202 pages. Similar evidence can be obtained from space in Chemical Abstracts or from number of papers at national scientific meetings.

7. Biochemistry is a discipline of wide general application and a biochemistry department should not carry an adjective of professional connotation. We do not say Agricultural Botany, Commercial Mathematics, or Medical Zoology for these fundamental departments which serve a university-wide function.

We trust that in this presentation we have shown that:

a. It is academically sound for a department to be known by what it is -- in this instance the Department of Biochemistry.

b. That there is precedence for this request -- so much so that in fact our department at Ohio State is among the last to hold on to a name which does not mean "biochemistry" in the present day usage. Only seven out of 137 departments giving Ph. D. s in biochemistry now carry the adjective "agricultural". The country's leading department of biochemistry, at the University of Wisconsin, changed its name 25 years ago, when its incumbent president became chairman of the department.

c. The requested change will indicate to the world the dynamic nature of our thinking on this campus with respect to biochemistry and biology in general.

d. The change will stimulate growth in a much needed area.

In previous requests for changing the name of the Department of Agricultural Biochemistry, the seemingly unsurmountable obstacle has been what has been loosely referred to as "the organizational problem". If this refers to the concerns of the Department of Chemistry in the College of Arts and Sciences or the Department of Physiological Chemistry and Pharmacology in the College of Medicine, then we believe that any fears can be allayed.

In the first place, we are hopeful that more biochemically - oriented research will be done in all departments of this University. It would be desirable for several departments to have one or more biochemists on their faculties. So long as there are n ot unnecessary course duplication, this would add to the strength of all areas of biology on this campus.

There is little historical reason to believe that either the Department of Chemistry or the Department of Physiological Chemistry and Pharmacology are particularly anxious to move into the area of general educational and research needs as envisaged by the Department of Agricultural Biochemistry. Currently, the Department of Chemistry offers no courses in biochemistry. Traditionally, the medical biochemistry groups have not felt it desirable to serve a general educational function in biochemistry. We are, therefore, convinced that the academic program in biochemistry can and should be supported in the Department of Agricultural Biochemistry with its name changed simply to Biochemistry.

In years past, through many conferences and communications, the Department of Agricultural Biochemistry has sought a cooperative effort in promotional material to be sent out so that there could be common understanding and unification of standards for graduate programs in biochemistry. It has

even been suggested that the three departments pool staff help to teach a one year's general biochemistry sequence such as 705, 706, 707, 708, 709 and 710 now taught in the Department of Agricultural Biochemistry. In this latter instance, it was suggested that the lecture be given a centrally located lecture room east of the river and that laboratory and equipment, and space for laboratory in Vivian Hall. By such moves, the Department of Agricultural Biochemistry hoped to encourage interdepartmental cooperation, to conserve teaching efforts by avoiding unnecessary duplication, and to provide better teaching, not only of this sequence but for other service type courses as well as for work with graduate students and for research. These efforts have, up to this date, not been successful. There is still reason for optimism and we are hopeful that a change in name may prove a part of the catalyst.

From time to time there have been questions concerning the movement of the Department of Agricultural Biochemistry to some other college. Such interest apparently stems from the belief that only in "certain" colleges can a department serve or be permitted to serve general University function for all students. This, we believe, is an assumption not in keeping with a true university -- a community of scholars. Of one thing we can be sure, The Ohio State University must have a program in biochemistry both for its fundamental role as a basic science and for its impact on the growth in the biological science. There is in the present Department of Agricultural Biochemistry the makings of a top flight department -- a department which has received approval and some financial support of its program by the National Institutes of Health through the establishment of a training program. Of the 137 departments offering Ph.D.s in biochemistry in this nation, only about 50 of them have had such programs approved. The program at Ohio State was recommended by Professor Albert Lehninger, Chairman, Department of Physiological Chemistry, Johns Hopkins Medical School; Professor G.W. Schwert, Department of Biochemistry, Duke University, and now Chairman of the new Department of Biochemistry at the University of Kentucky Medical School; and Professor Herbert Carter, Chairman of the Department of Chemistry, University of Illinois. We currently have in the Department of Agricultural Biochemistry a very good program and staff who are devoted to building an even stronger program. Our only purpose in being here is to enable this devoted team to serve this University more ably. If we cannot offer our own staff the opportunity to grow, we cannot offer it to new staff either, and hence a roadblock is being placed in our path to getting and retaining competent staff. Such an obstacle will almost guarantee a second or third rate biochemistry program. We will not be satisfied to seek any standard except top quality. Any prospective staff member that we would want can easily tell that O.S.U. is deficient in biochemistry. He can also see that we have great potential for growth. This is our greatest selling point. Dynamic individuals look for opportunities to grow in stature and in service and they must have assurance of a fertile academic atmosphere.

In conclusion we have shown that the name of this department does not indicate its function and that it is misunderstood on campus, is misinterpreted off-campus, is hampering us in bringing good students here, is a hindrance for bringing in outside funds upon which our growth in graduate education depends, and is an obstacle to recruiting and maintaining top quality staff for biochemistry. Further, we have given evidence that the University is not abreast of comparable institutions in this area; that biochemistry is the most active branch of chemistry today and that it is the catalyst for the growth of modern fundamental and applied biology whether oriented to agriculture or to medicine. We believe that we have indicated a need and a way to stimulate growth in the academic stature of this University.

Biochemistry is a basic science which has grown to a state of maturity such that it should not be labeled with a professional adjective. We earnestly hope that the Council on Instruction will give our proposal a vote of confidence and that prompt affirmative action can be taken on this problem which has been under active consideration for seven years. Such action will certainly give great encouragement to those of us who are working to build a signficant biochemistry program here and we are confident that this move on the part of this Council will bring great credit to The Ohio State University.

COLLEGE OF AGRICULTURE

Zoology	64
Botany	35
Agronomy	35
Agr. Biochemistry	28
Horticulture	28
Agr. Economics	21
Agr. Education	16
Dairy Science	9
Poultry Science	9
Home Economics	9
Dairy Technology	6
Animal Science	5
Hydrobiology	3
	268

COLLEGE OF ARTS

Chemistry	148
Physics	59
Speech	52
Bacteriology	35
English	30
History	19
Political Science	14
Romance Language	14
Geology	14
Mathematics	12
German	5
Philosophy	4
Classical Language	3
Optometry	3
	412

COLLEGE OF COMMERCE

Business Org.	49
Sociology	24
Economics	16
Geography	13
Accounting	5
Social Adm.	2
	109

COLLEGE OF EDUCATION

Psychology	147
Education	140
Fine Arts	24
Physical Education	9
	320

COLLEGE OF MEDICINE

Physiology	18
Physiol. Chemistry	4
Anatomy	3
	25

COLLEGE OF ENGINEERING

Chemical Eng.	21
Electrical Eng.	16
Mechanical Eng.	11
Industrial Eng.	9
Metallurgical Eng.	8
Ceramic Eng.	8
Aeronautical Eng.	3
Engineering Mechanics	2
Minerology	2
Civil Eng.	1
	81

Agriculture	268
Arts	412
Commerce	109
Education	320
Medicine	25
Pharmacy	21
Veterinary Medicine	8
Engineering	81
	1244

Ph.D.'s EARNED IN 1956-1959 INC. IN VARIOUS BRANCHES OF CHEMISTRY AT THE UNIVERSITIES OF ILLINOIS, MICHIGAN, MINNESOTA, WISCONSIN AND THE OHIO STATE UNIVERSITY

	Department of Chemistry					Depts. of Biochemistry	
	Organic	Phys.	Inorg.	Anal.	Biochem.	Budgeted in Agr.	Budgeted in Med.
Illinois	95	21	24	24	22		8
Michigan	28	17	6	11			15
Minnesota	44	18	7	14		32	13
Wisconsin	35	50	17	7		92	5
O.S.U.	49	46	6	16		17	6
Sub total					22	141	47
TOTAL	251	152	60	72		210	

STATISTICS ON GRADUATE EDUCATION FOR THE PH. D. 1953-1958

Department	No. of Ph. D. s	Total Graduate Enrollment	Graduate Students /Staff	Graduate Students /Ph. D.	Rank in Reverse Order	Staff*	Ph.D. /Staff	Rank
emistry	148	949	33.6	6.41	10	28	5.29	1
chology	147	733	26.0	5.00	4	28	5.25	2
ication	140	2016	48.0	14.40	25	45	3.11	5
ology	64	426	11.2	6.66	11	38	1.68	12
sics	59	443	14.8	7.51	13	30	1.96	10
ech	52	378	13.0	7.27	12	29	1.79	11
siness Organization	49	465	15.0	9.49	18	31	1.58	14
cteriology	35	201	18.2	5.74	7	11	3.18	4
any	35	219	10.4	6.26	9	21	1.66	13
conomy	35	147	9.8	4.20	2	15	2.34	6
glish	30	318	10.6	10.60	19	30	1.00	20
icultural Biochem.	28	109	20.2 18.2	3.89	1	5.4 6	5.20 4.67	3
ticulture	28	156	13.0	5.56	6	12	2.33	7
e Arts	24	142	5.1	5.92	8	28	0.86	23
iology	24	194	0.92	8.08	15	21	1.14	19
icultural Economics	21	191	8.3	9.10	16	23	0.91	22
mical Eng.	21	253	28.1	12.05	21	9	2.33	8
rmacy	21	112	12.44	5.33	5	9	2.33	9
tory	19	214	11.3	11.26	20	19	1.00	21
siology	18	136	9.1	7.55	14	15	1.20	17
icultural Education	16	220	18.3	13.75	24	12	1.33	16
nomics	16	206	9.0	12.88	23	23	0.70	26
itical Science	14	175	19.5	12.50	22	9	1.55	15
nance Languages	14	131	7.3	9.36	17	18	0.78	25
graphy	13	63	5.7	4.85	3	11	1.18	18
hematics	12	206	9.8	17.17	27	21	0.57	27
chanical Eng.	11	232	16.6	21.09	28	14	0.79	24

npiled from data in Graduate School Record, Vol. 12, No. 1, Autumn 1958, and from the versity Directory 1957-58.

ncludes Professors, Associate Professors, Assistant Professors.

BIOCHEMISTRY AT THE OHIO STATE UNIVERSITY

J. B. Brown, Chairman
Department of Physiological Chemistry and Pharmacology

This is a reply to the extensive description of the program of the Department of Agricultural Biochemistry and request for change in name to the "Department of Biochemistry" submitted to the Council on Instruction in December 1961.

Dr. Deatherage's documentation as to the history and development of the present Department of Agricultural Biochemistry (hereafter designated as ABC) is indeed impressive. The department is to be congratulated on its accomplishments and progress. However, in this reply to his request for change of name, I shall try to show that biochemistry on the Ohio State University campus is far broader in practice and actuality than the present ABC department. It is unfortunate, but perhaps understandable, that Dr. Deatherage has always emphasized the accomplishments and role of his own department almost to the exclusion of the other important biochemical interests on this campus. There will be presented below, therefore, first a statement of the total biochemical picture at OSU, then a statement of our concurrence with certain of his proposals, and finally a recommendation as to the request for the change in name of ABC.

I. THE SCOPE OF BIOCHEMISTRY AT OHIO STATE UNIVERSITY

The discipline of biochemistry, one of the most important of life sciences, is presently centered at Ohio State University primarily in two departments, namely ABC and the Department of Physiological Chemistry (hereafter designated as PC). Both ABC and PC are departments in basic and applied biochemistry. However, along with the programs of these two departments, biochemical research is and has been in progress in many of the university departments and is actually more university-wide in scope than is the program of the Department of Chemistry in the College of Arts and Sciences. It is unnecessary for me to further elaborate on the program in ABC, which has been described so effectively by Dr. Deatherage. I propose therefore to describe the program of the Department of Physiological Chemistry in some detail and then to summarize briefly many other facets of biochemistry on the OSU campus. In conclusion, I shall make some suggestions for planning the future of biochemistry at Ohio State University.

It seems clear to me personally that the interests of the two departments and many of the other interests on the campus would be better served by one strong department of biochemistry. Surely, also, there should be integration of the graduate program of this unified department with that of Chemistry. The principal impediment to this re-organization is lack of adequate space facilities, centrally located, which, of course, would be provided by the building suggested in Dr. Deatherage's report. For clarity this part of my remarks has been divided into three sections: A. The Program of Agricultural Biochemistry; B. The Program of the Department of Physiological Chemistry; and, C. Biochemistry at OSU outside of these two departments.

A. The Program of Agricultural Biochemistry

For details see Dr. Deatherage's report.

B. The Program of the Department of Physiological Chemistry

1. Historical *

Previous to 1920 physiological chemistry was taught in the Department of Physiology. Dr. Clayton Smith (Ph.D., Columbia, in biochemistry; M.D., Northwestern) was brought here to head a combined department of physiological chemistry and pharmacology. The department moved to the Ohio State University campus in 1925. In 1933 our department occupied about 5,000 sq. ft. of space in Hamilton Hall, and an additional 2,500 sq. ft., mainly research, in Kinsman Hall. Present space facilities in Hamilton Hall are the following (in sq. ft.): offices, 3,500 sq. ft.; teaching laboratories, 7,650 sq. ft.; research laboratories, 8,000; store rooms, 1,400; conference and seminar rooms, 450; toxicology, 770; storage, 520 (total about 22,000). About 80 per cent of this space is devoted to physiological chemistry and the remainder to pharmacology. (NOTE: In the remainder of this section the major emphasis will be our activities in physiological chemistry except with reference to our graduate program, summary of which will include Dr. Marks' interests since his work may be described to be the biochemical aspects of pharmacology. Teaching programs in pharmacology will not be included.)

2. Teaching Programs in Physiological Chemistry

Teaching programs of the department are conducted at the undergraduate and professional levels (basic biochemistry) and at the graduate level.

a. Undergraduate and Professional

(1). Fundamental biochemistry, including nutrition, for first year medical students, Autumn and Winter Quarters, 12 hours, lecture, conference, and laboratory, 130-140 students.

(2). Fundamental biochemistry (6 hours) and nutrition (2 hours) for first- and second-year dental students. The former includes lecture, conference, and laboratory. The nutrition course is lecture only. Approximately 150 students take each of these courses.

(3). Basic biochemistry for Arts College and graduate students, Courses 611-612-613; total 13 hours. Approximately 60 students have been taking this course, about one-fourth of which are graduate students (from PC and several other departments), and the remainder from the Arts College and other colleges on the campus. Registration for last autumn quarter was 80. In addition, Course 614, Food Analysis, is taught as part of the Arts College major requirements and as an elective for other students. Five to 15 students take this course. Current quarter enrollment is 16.

b. Graduate Program

A full program leading to the M.Sc. and Ph.D. degrees including advanced didactic and laboratory courses, seminar and research is in progress. The

* For details see "History of the Ohio State University College of Medicine," 1961, by N. Paul Hudson. This covers the period 1920-1957.

number of graduate student majors varies between 12 and 25, with 29 listed last autumn quarter, of whom three are majors in pharmacology. The advanced biochemistry sequence in this program includes three 3-hour courses, autumn, winter, and spring quarters, with advanced presentation of the major aspects of biochemistry; in addition, one or two laboratory courses involving advanced preparations and instrumentation are presented. In our graduate program students are required to take an advanced sequence in organic chemistry and to minor in some other bio-science such as microbiology, physiology, or biology. A mimeographed outline of suggested curricula leading to the M.Sc. and Ph.D. degrees is appended.

It was inferred in Dr. Deatherage's report that biochemistry is primarily a graduate teaching discipline. We would strongly dispute this statement. We would insist that our undergraduate courses in biochemistry over the years have included the basic concepts of this science and have inculcated in a tremendous number of professional and other students at Ohio State an appreciation and understanding of the subject. It is true that our dental courses are taught at the junior level but our Arts College and the College of Medicine sequences are taught with prerequisites of three years of chemistry, namely, at the senior level. Furthermore, 95 per cent of the students who take the medical sequence have baccalaureate degrees. Since 1925 this department has taught basic biochemistry to some 4,000-5,000 M.D.'s and about two-thirds that number of D.D.'s. Who will not say that this has been a real contribution in the way of inculcating the principles of and an appreciation of biochemistry in these professional groups. It is also estimated that over the past thirty-five years some 1,200-1,500 College of Arts and Science seniors and 500 graduate students have been initiated into the concepts of biochemistry by the undergraduate teaching program of this department.

Well over one hundred M.Sc. degrees and 35 Ph.D. degrees have been earned in this department. In addition, four students received the Ph.D. degree in the Chemistry Department and four others in ABC, their research programs having been preceptored by the present chairman of PC and carried out in its research laboratories.

3. Staff of the Department

The senior staff of the department, as presently organized, may be placed in two categories, those appointed and budgeted primarily in this department and those budgeted primarily in other departments of the Health Center but in their capacity and training as biochemists given courtesy academic titles in PC. This latter group is designated below with an "*" after their names and with their primary appointment listed in parenthesis. Most of these courtesy appointments help us substantially in our teaching and research programs at all levels, but budgetwise their primary mission is research in their primary department. This policy of courtesy appointments is one begun in this department about ten years ago and has been greatly expanded by the present chairman. This is a significant contribution to biochemistry in the Health Center because professional biochemists are hesitant to accept appointments in the clinical departments where they do their research unless they are recognized professionally in the department of their principal discipline.

The present staff of the department is listed below along with institution of their graduate training and a brief statement of their principal fields of investigation.

PROFESSORS:

J. B. Brown, Chairman
Ph.D., University of Illinois, 1921
(Fundamental chemistry of the fatty acids, especially the polyunsaturated (essential) fatty acids; search for new and unique acids in fats and oils; chemistry of waxes; lipid methodology and metabolism; nutrition)

W. J. Frajola * (with Pathology)
Ph.D., University of Illinois, 1950
(Cancer research; electron microscopy of cell and cell particulate units; enzymes, and enzyme systems in diagnosis; enzymology.

R. M. Johnson * (Director of Laboratories, Institute of Nutrition and Food Technology)
Ph.D., University of Wisconsin, 1948
(Metabolism of phospholipids in relation to cell division; factors concerned in the metabolism of the dividing cell; atherosclerosis; nutrition; nutrition and metabolism in geriatrics.

ASSOCIATE PROFESSORS:

D. G. Cornwell
Ph.D., Stanford University, 1954
(Structure and metabolism of complex lipids and lipoproteins; mechanisms for the absorption and transport of lipids and fat-soluble vitamins; atherosclerosis)

A. W. Devor
Ph.D., Southern California, 1947
(Analytical chemistry of carbohydrates and mucopolysaccharides; studies in the chemistry of Gaucher's disease; chemistry of mucopolysaccharides in urine)

F. A. Kruger * (with Medicine)
M.D., Ohio State University, 1951
(Blood transport mechanisms; the serum lipoprotein system; the mechanisms of action of insulin and synthetic hypoglycemic agents; the role of lipids in metabolic mechanisms)

H. L. Wikoff
Ph.D., Ohio State University, 1924
(Quantitative chemistry of spinal fluid, blood, and urine; assay of tranquilizing drugs; chemistry of aqueous humor; metabolism of unicellular organisms)

ASSISTANT PROFESSORS:

G. L. Endahl * (with Surgery)
Ph.D., University of Oklahoma, 1959
(The role of pancreas in gastric acid secretion; metabolism of androgens)

Roland Fischer * (with Psychiatry)
Ph.D., University of Basel, 1945
(Mechanism of differential dye absorption in relation to nervous activity; neuronal pathways of excitation and depression; biochemical factors involved in the mechanism of taste blindness; affinity to protein of compounds and its relation to pharmacological activity; taste blindness and its relation to food dislike; the relation of thyroid metabolism to taste blindness.

R. H. McCluer * (with Psychiatry)
Ph.D., Vanderbilt, 1954
(Structure and metabolism of glycolipids; neuraminic acid metabolism; plasma protein alteration in schizophrenia; biochemistry of Rh antigen.

K. E. Richardson
Ph.D., Purdue, 1958
(Intermediary metabolism and enzymology; endogenous oxalic acid toxicity; characterization of plant phosphatases; metabolism of ethanolamine, glycolaldehyde, phytic acid, inositol, and short chain acids)

NOTE: Professors Leake and Marks, Assistant Professors Engelman (part time), Goldman and Danellis, and Instructor, Gwendolyn Carson, are actually in the pharmacology teaching program.

The senior staff in biochemistry noted above represent professional degrees from Southern California, Vanderbilt, Illinois (2), Stanford, Wisconsin, Purdue, Oklahoma, Basel, and Ohio State (2).

4. Research Program of the Department of Physiological Chemistry

a. General Description of the Program

The individual research interests of senior staff members in the department were included in the staff listing in the preceding section. These may be summarized again very briefly as follows: electron microscopy; metabolism of unicellular organisms; nutrition; chemistry of proteins and nucleoproteins; biochemistry and metabolism of lipoproteins; the mucopolysaccharides; tissue culture; enzymes; biochemical problems in cancer research; biochemical factors in cardiovascular disease; methods for the analysis of body fluids; metabolic functions of the essential fatty acids; blood transport mechanisms; mechanism of action of insulin; androgen metabolism; glycolipids; neuraminic acid metabolism; plant phosphatases; metabolism of atheromatosis. Several of our senior staff members are interested in various aspects of enzymology. A long series of researches on the chemistry and biochemistry of fats and oils has been in progress over the years. We believe that these various fields of investigation represent broad concepts of basic biochemistry as well as important applications of biochemistry to the health sciences. In this connection it is to be pointed out that many of the most important advances in medicine throughout this country have been carried out in departments of biochemistry associated with colleges of medicine.

b. Financial Support of Departmental Research

In the previously mentioned history of the College of Medicine, including the period up to 1957, research grants totalling some $250,000 are listed. These grants included projects in the Research Foundation (16) directed to such subjects as digestibility of fats, chemistry of saliva, salivary proteins, preparation of drying oils from fish oils, fundamental studies on solubilities of fatty acids at low temperatures, Quartermaster Corps projects on exchange fats for leather, and several grants from the Air Force. Other important funds came from the Wyeth Corporation to support a fundamental study of human milk fat. Several grants from the Comly Fund, $22,000, were made to senior staff members to support research in their several fields of interest. Other grants through the Development Fund and the Institute of Nutrition and Food Technology were devoted to work on chemistry of butterfat, gastric and duodenal lipids, and coffee oil. Two large grants from the S. C. Johnson and Sons were made for the fundamental study of the composition of the natural waxes. Likewise, two large grants from the National Institutes of Health were initiated just previous to 1957 covering fundamental studies on the absorption and metabolism of fats and the biochemistry of plasma lipoproteins. Large grants from the Central Ohio Heart Association were devoted to research on the biochemistry of blood and atheromatosis, enzyme patterns in cardiovascular disease, and postdoctoral fellowships. From the university committee to support research came $14,000 to support fundamental work on the chemistry of the polyunsaturated acids. The research grants in progress 1957 to date are herewith summarized more specifically: -

RF 1033 (NIH) -	Dec. 1, 1957 - Nov. 30, 1962 Lipid metabolism: absorption and transport	$73,000
RF 1036 (NIH) -	Dec. 1, 1956 - Nov. 30, 1961 Biochemistry of the lipids of human plasma beta-lipoprotein	$29,000
RF 1404 (NIH) -	Dec. 1, 1961 - Nov. 30, 1962 Lipoproteins and cellular organization (1st year of 5-year grant)	$17,000
RF 1217 (NIH) -	Jan. 1, 1961 - Dec. 31, 1962 Ethanolamine metabolism in animals and plants	$23,500
Comly Fund -	July 1, 1960 - June 30, 1962 Endogenous oxalate toxicity in rats	$3,600
RF 1023 (NIH) -	Sept. 1, 1959 - Aug. 31, 1962 Fractionation studies on nondialyzable materials of human urine	$35,500
M 1637-C2 (NIH)-	1959-1960 * Biosynthesis of neuraminic acid	$9,000
RF 1299 (NIH) -	June 1, 1961 - May 31, 1962 Isolation and identification of RH_o (D) antigen (1st year of 5-year grant)	$29,300

RF 1272 (NIH)	April 1, 1961 - March 31, 1962 Control of pituitary ACTH secretion (1st year of 5-year grant)	$11,500
RF 921 (NIH)	May 1, 1959 - April 30, 1962 Interaction of drugs with basophilic granulocytes (3rd year of 5-year grant)	$50,000
RF 1150; 1315	(COHA) - July 1, 1960 - June 30, 1962 Distribution of radioactive labelled digitalis glycosides in heart muscle	$9,000
RF 954; 1053 (COHA)	Dec. 1959 - June 30, 1960 Biochemical studies on plasmalogen	$5,800
RF A4052 (NIH)	June 1, 1960 - May 31, 1962 ** Effect of hypoglycemic agents on cell metabolism (2nd year of 5-year grant)	$35,000
RF 811 (Air Force)	June 1, 1958 - October 31, 1959 Serum enzyme screening test	$18,490
RF 706 (Air Force)	September 1, 1956 - August 31, 1959 Mechanism of action of deoxyribonuclease	$36,016
RF 900 (Air Force)	February 1, 1959 - January 31, 1960 Mechanism of action of certain CNS stimulants	$16,036
RF 1116-H (Olin-Mathieson Chemical Corp.)	October 1, 1959 - June 30, 1959 Toxicity of Decaborane on Animals	$7,500
RF 1119 (Procter & Gamble)	June 1, 1960 - September 30, 1961 *** Role of carbonic anhydrase in oral calculus formation	$10,764
RF 1293 (Air Force)	June 1, 1961 - May 31, 1962 Investigations into fatty acid clearance of the blood	$7,300
RF 1351 (NIH)	September 1, 1961 - August 31, 1962 *** Serum enzymes in minimal and manifest liver toxicity	$13,360
RF 1045	January 1, 1960 - December 31, 1961 *** Changes in serum enzymes and vitamin B_{12} in liver damage	$16,972
RF 911 (NIH)	Jan. 1, 1961 - Dec. 31, 1962 Phospholipid metabolism in relation to cell division (1st and 2nd years of a 3-year grant)	$29,140

RF 1218 (NIH)	- Jan. 1, 1961 - Dec. 31, 1962 **** The biochemical role of the essential fatty acids (1st and 2nd years of a 3-year grant)	$36,927
	TOTAL	$523,615

* - Grant in Department of Psychiatry, but work done in our laboratories.

** - Grant in Department of Medicine but supporting our graduate program.

*** - Grant in Department of Pathology, but supporting graduate students in this department.

**** - Grant to Ralph M. Johnson, Institute of Nutrition and Food Technology.

c. Publications, Research Productivity

The first publication in this department appeared in 1923; it described the quantitative determination of phosphorus in blood. Since 1926 publications have appeared annually, the total up to 1957 (History of the College of Medicine, loc. cit.) being 236 of which 174 may be classed as experimental contributions. The largest number to appear in a single year was ten in 1941. These covered a wide range of subjects including clinical biochemistry; methods of analysis of body fluids; biochemistry of yeast metabolism; steroid excretion; factors in gastric acidity; silicosis; enzymology; biochemistry of Hodgkin's disease; electron microscopy of nucleic acid and tissue cells; biochemistry of tissue lipids; composition of fats; analytical methods for fats; development of the technique of low temperature crystallization in the separation of fatty acids; chemistry of polyunsaturated acids; chemistry of natural waxes; lipoproteins; etc. The largest single series of publications was in the field of the chemistry and biochemistry of the fats and fatty acids. Since 1955 this subject has gradually developed into more emphasis on absorption, transport, and metabolism of the lipids. The annual publication output since 1957 is the following:

July 1957 - June 1959	
Experimental papers	22
Others	24
July 1959 - June 1960	
Experimental papers	19
Others	17
July 1960 - June 1961	
Experimental papers	22
Others	16

d. Comment

The publications, as cited above, were in a wide variety of scientific journals such as, for example, Journal of Biological Chemistry, Archives of Biochemistry and Biophysics, Biochemica et Biophysica Acta, Journal of Lipid Research, Journal of the American Oil Chemists' Society, Journal of American Chemical Society, American Journal of Clinical Nutrition, Journal of Experimental Medicine, Analytical Biochemistry, Plant Physiology, Proceedings of Society of Experimental Biology and Medicine, etc., etc.

All three of the professors in the department are members of the American Society of Biological Chemists which is one of the most difficult scientific organizations in which to secure membership that presently exist. The chairman of the department has been a member of this organization since 1928.

Commenting still further on the research productivity of the department, particularly over the past ten years, it should be stated that in view of the excessive teaching missions in comparison with number of full-time senior staff it borders on the remarkable that so many papers have resulted. Naturally, this would have been impossible were it not for the fact that over the years the department has had on its A-1 budget a number of teaching assistants who provided not only help in teaching but an important nucleus of graduate students who contributed to the research program in the course of pursuing their advanced courses of study. Also, the extensive grants made to senior staff members have supported numerous graduate students in their professional training.

C. Biochemistry at the Ohio State University in Departments Other Than ABC and PC

In sections A. and B. above the programs of biochemistry in ABC and PC have been noted. We believe that the background of PC and the breadth of its program are as broad or even broader than that of ABC. However, the combined programs of both departments still fall far short of the total over-all biochemistry interests on this campus. It would take an undue amount of time and even some research for me to fully describe these other campus interests. What is presented in this section therefore is little better than a casual recapitulation and summary of the biochemistry in other departments and institutes, the scope of which is indeed campuswide.

1. <u>The Preclinical Sciences in the College of Medicine</u>

While there are no Ph.D. biochemists in the Departments of Anatomy, Physiology, and Microbiology, many of the faculty of these departments have training in biochemistry and many of their research programs require the application of advanced biochemical techniques. Specifically, for example, Dr. Knouff and his group have long been interested in histochemistry, and we have cooperated with his group in this phase of biochemistry. The research staff of anatomy frequently consult our senior staff on biochemical problems. Likewise, several papers have appeared describing cooperative work between our department and the Department of Microbiology (College of Arts and Sciences). Bacterial metabolism is inherently biochemical.

For a long time Dr. G. Y. Shinowara, the second Ph.D. in PC, was associated with the Department of Pathology. When he left Ohio State to take over clinical biochemistry in several large New York hospitals, his position was taken by Professor Walter Frajola who holds joint appointments in pathology and in our department. He is a well-known enzymologist, teaches one of our graduate courses, and precepts several of our graduate students.

2. The Clinical Sciences in the College of Medicine

a. Department of Medicine

Dr. Fred Kruger is a biochemist, trained in PC, and has a series of publications in biochemistry. He teaches one of our advanced courses, lectures to our medical students, and is preceptor for several of our graduate students. Dr. C. W. Denko is a Ph.D. biochemist from Pennsylvania State University. He also holds the M.D. degree and has a large series of publications. His field of research is the biochemistry of connective tissue, collagen, arthritis, etc. The writer of this report is on the Advisory Committee of the Metabolic Research Unit of the Department of Medicine.

b. Department of Surgery

Dr. Gerald Endahl is a Ph.D. biochemist from the University of Oklahoma with joint appointment in our department. His research is concerned with the biochemical problems in surgery. It should be pointed out furthermore that the science of biochemistry (and nutrition) is more and more being applied to the management of surgical patients and to surgical research.

c. Department of Psychiatry

Drs. Robert McCluer and Roland Fischer are Ph.D. biochemists with courtesy appointments in PC. Both give us substantial aid in our teaching and research programs. It is worth noting here that psychiatry, like the other clinical departments, requires biochemists on its staff.

d. Department of Pediatrics

Clinical biochemistry is a most valuable adjunct to the diagnosis and treatment of children's diseases and to research in pediatrics. Dr. Samuel Meites, Ph.D. in ABC (OSU), is a biochemist associated with the research program of this department. The chairman of PC is a member of the advisory committee of the proposed new clinical research unit of Children's Hospital.

e. General

Biochemistry has played a most important role in the development of modern medicine, and our clinical staff is fully aware that more and more will be required of the biochemist in both the teaching and research programs of the several clinical departments in the College. Plans are under consideration to more fully integrate teaching the basic sciences, including biochemistry, in the first two years of the medical curriculum. The National Board as well as the Specialty Board examinations are increasingly requiring a

fundamental knowledge of basic biochemistry. In the future therefore more and more emphasis in all of the medical sciences is bound to be directed to the discipline of biochemistry, including, in addition to the departments mentioned above, the Departments of Gynecology and Obstetrics, Preventive Medicine, and Ophthalmology. Any changes in the organization and integration of biochemistry on this campus should take these facts into full account.

3. College of Dentistry

While there are no Ph.D. biochemists presently on the staff of the College of Dentistry, PC serves a most important function in teaching courses in biochemistry and nutrition to students in this college. A project has been under way for several years in the College of Dentistry studying the etiological factors of dental caries which include biochemical, microbiological, and nutritional factors. Members of the PC staff have been participants in this study since its beginning.

4. College of Agriculture

Much biochemical research is in progress in agriculture outside of ABC. Only two or three examples will be noted here, namely, the fact that the Department of Poultry Science has on its staff Dr. Edward Naber, a Ph.D. biochemist from Wisconsin. Likewise Dr. James Harper of the Department of Dairy Technology is a dairy biochemist from Wisconsin. Dr. James Mortensen of the Department of Agronomy lists as his field of research interest, soil biochemistry. Many of the problems in Animal Science, Horticulture, Home Economics, and probably other departments require advanced biochemical techniques for their solution. Any new unified department of biochemistry must take into account this research service function in the departments of the College of Agriculture.

5. College of Arts and Sciences

Since 1930 PC has listed curricula in the College of Arts and Sciences leading to the B.A. and B.Sc. degrees. Two members of our senior staff are on the faculty of this college.

Several of the staff of the Department of Chemistry are interested, at least at the research level, in problems in or closely related to biochemistry, notably Professors Newman, Wolfrom, and Van Winkle. One graduate course has been listed on chemistry of the kinetics of enzymes. It is unfortunate, and indeed to be deplored, that so few of the graduate students in chemistry have been encouraged to take the courses in basic biochemistry which have been available in PC and in ABC. On the other hand, both PC and ABC require of their graduate students a fundamental and thorough knowledge of chemistry. Both departments require certain advanced sequences in chemistry. This unfortunately has not been reciprocated by the Department of Chemistry.

6. Institute of Nutrition and Food Technology

This Institute was originally planned on an almost campuswide basis by a committee of the Graduate School in 1946. Four members of the founding committee were from departments in the College of Agriculture, including present Dean T. S. Sutton, and the then chairman of the Department of Agricultural Biochemistry, Dr. John Lyman.

The original objective of this Institute was to promote instruction and research in nutrition and in food technology, - in other words, to be the major factor in promoting the two disciplines of food technology and nutrition on the OSU campus. It is interesting to note that it was in the thinking of the original committee that the Institute be provided with a large building of some 20,000 square feet of space, which would provide biochemical, microbiological, and physical chemical services to any department on the campus which needed these services. It was hoped, in this way, to avoid the necessity of providing biochemical laboratories all over the campus to service individual departments and to avoid the necessity of a vast duplication of instrumentation. The major objective of the Institute was to promote research in these disciplines, thereby facilitating the research programs of individual professors and the training of graduate students in these important disciplines, with strong backgrounds in biochemistry and microbiology.

The Institute occupies 6,000 square feet of office and laboratory space in the Research Center, largely at present devoted to biochemical and microbiological research. In planning the addition of several new staff members to the Institute it is intended that in each instance the staff member shall be first of all either a biochemist or a microbiologists. Dr. Ralph Johnson, Director of Laboratories, holds academic titles in Animal Science, Horticulture, Home Economics, and PC. He is a Ph.D. biochemist from the University of Wisconsin.

The laboratories are well equipped for advanced biochemical research, and, in fact, are nearly the equal space-wise of the research laboratories of either ABC or PC.

These facts are included here to explain that the Institute's laboratories are a valuable contribution to biochemistry on the OSU campus.

7. <u>The Institute of Vision</u>

This institute has recently planned and is bringing into being a well-equipped biochemical laboratory dedicated to biochemical research in vision. It is planned, I believe, that biochemists will be on the staff of this institute.

II. COMMENTS ON THE PROPOSALS OF AGRICULTURAL BIOCHEMISTRY

It is our intention in this section to comment on certain of the general proposals in Dr. Deatherage's report. As will be stated later, certain of the proposals have decided merit. On the other hand, it is clear that Dr. Deatherage misunderstands and ignores the ideals, missions and objectives of PC and chooses not to mention other biochemical interests on the campus, as much or more than he alleges his department is misunderstood. After commenting on certain specific phases of the ABC report I will conclude by quoting in part from the comments of two of the professors of PC, submitted to me in writing. It is to be hoped that the statements below will clarify some of the misunderstanding. Page references below are to Dr. Deatherage's report.

1. Page 3, Paragraph 3

ABC: "In spite of the difficulties which have come to the department by virtue of its having to function with a name which inadequately describes its work, the teaching program has been continually upgraded so that the department now has what is recognized by biochemists throughout the nation, as a sound, though extremely limited (due to a small faculty) program in biochemistry. The evolution of our academic program was carried on while attempting to work out among other interested groups in the University some measure of unanimity in the thinking of what a graduate program in biochemistry should be."

REPLY: No disagreement here, except that we do not feel that the name of the department, per se, has been an important factor here.

2. Page 5, Paragraph 1, lines 4-10

ABC: "We would argue that in one or the other of these colleges there should be developed along with applications of biochemistry a strong program in fundamental studies involving the chemistry of life. It might even be developed in both areas to the great advantage of the University which would perceive the merit of such a development. In any event, neither such department should be deprived of the name 'biochemistry' for then a variety of interdepartmental programs and policies might well be developed."

REPLY: Both ABC and PC presently have broad programs. Our department holds, however, that its program is broader than that of ABC in that it contributes to the Colleges of Medicine, Dentistry, Arts and Sciences, and, in its undergraduate sequence, to a broad spectrum of students at the undergraduate level. ABC here actually has the advantage of having the name 'Biochemistry' in its name. We in this department feel that the disadvantages of having the name 'Agricultural Biochemistry' are vastly exaggerated. In fact we feel further than the term 'agricultural' is perhaps as desirable as if we were to put the term 'medical' ahead of physiological chemistry or 'medical biochemistry'. Biochemistry is biochemistry in whatever college it is budgeted. We would be the last to disparage the achievements in biochemistry of ABC.

3. Page 5, last paragraph

ABC: "The volume of publications in chemistry indicates that biochemistry is today far the most active of all the branches of chemistry. This is understandable because the disciplines and principles of biochemistry are applicable to almost all branches of biology and to chemistry as well; a biochemist must be a biologist as well as a chemist. It is for that reason that a biochemistry department cannot limit itself to the professional training of biochemists. By the very nature of the field, a biochemistry department must serve a university-wide general education function. To encompass these responsibilities will require a much larger department unhampered by a name no longer appropriate to its function."

REPLY: The ABC report is correct in that biochemistry is no doubt the most active of all branches of chemistry. Not only this but its over-all significance in the vast field of health sciences cannot be over-emphasized. So far as mankind is concerned, biochemistry finds its most significant applications in the life and health of mankind, this importance being even greater we believe than its importance to the agricultural sciences.

4. Page 6, 1st paragraph

ABC: "Biochemistry itself is essentially a graduate subject."

REPLY: We violently disagree with this. As a graduate subject it is necessary in the training of biochemists but its implications are far broader than this, because all of the biosciences require biochemistry in their proper development. We feel that the undergraduate and teaching services to our professional men and to other undergraduate students in the biosciences create an appreciation for the subject permitting it to achieve its maximum usefulness in all aspects of the health and agricultural sciences.

5. Page 6, Paragraph 2

ABC: "At the present time the courses offered in the Department of Agricultural Biochemistry are designed to serve three groups of students--those who wish a descriptive treatment of biochemistry to round out their educational programs; those who are going into a profession which requires some knowledge of biochemistry; and those who wish to become proficient to the place that the quantitative disciplines occupy a primary position in their education. This last group includes graduate students majoring in biochemistry or some field of chemistry or biology closely related to it."

REPLY: The statement in this paragraph delineates the groups of students served by ABC. In further comment it may be said that the teaching and research programs of PC encompass these same groups.

6. Page 6, Last Paragraph

ABC: "Because biochemistry fits into curricular programs essentially at the graduate level, research is of primary importance to the development of a strong department."

REPLY: True, but, again, we feel that biochemistry fits into both undergraduate and graduate programs.

7. Page 7, Paragraph 3, first 7 lines:

ABC: "It is believed that the needs of biochemistry at The Ohio State University are larger than anyone who has not given considerable thought to the matter, would ever guess. Since the Department of Biochemistry should serve a university-wide function--not merely a service of the Colleges of Agriculture and Home Economics, Veterinary Medicine or Medicine, it is essential that plans for the future match the rapidly increasing stature of this great University."

REPLY: Excellent.

8. Page 7 and Page 8, 5 Proposals

REPLY: With the exception to the proposal to change the name of ABC, the remaining proposals are essentially sound. The size of the proposed staff and the physical facilities as described would appear to be fully adequate. Such a coordinated program in biochemistry at OSU should receive the support of all interested parties. Where this department should be placed budgetwise will be commented upon below.

9. Page 9, 1st Paragraph

ABC: "These funds have come from the Rockefeller, Kettering and Frasch Foundations; Harvard University, National Academy of Sciences--National Research Council, as well as from the Research Corporation, National Science Foundation, National Institutes of Health, and other groups. Of particular and significant interest to the Council on Instruction is that the department received the first basic science training grant from federal sources ever given to The Ohio State University--a grant specifically to support graduate and postdoctoral education in biochemistry. To qualify the academic program must be sound, the educational research imaginative, the facilities adequate, and the staff competent. Who decides whether or not an application for such a grant is approved--a committee of leading biochemists of the country--our peers."

REPLY: ABC is to be congratulated on $800,000 in support over the last five years. Our department cannot quite match this, but it is on its way. The combined grant program of the two departments would approach over 1 1/3 million dollars, which even in the present state of "disorganization" is a bit impressive. While we have noted that one or two grants to ABC were turned down because of the name of the department, we would challenge the breadth of vision of the committees which rejected these grant proposals. Why anyone would refuse a grant because of a departmental name is amazing. Actually it would appear that in spite of the present name of the department ABC has done very well and is again to be congratulated.

10. Comment of Professor A in this department:

"Reference is made to the detailed statement of Dr. Fred Deatherage relating to the proposal to change the name of the Department of Agricultural Biochemistry. It is indeed impressive that the Chairman of the department would argue for a program requiring $4,200,000 for the establishment of a Department of Biochemistry on this campus. It is also impressive that he feels this job could be accomplished with twenty-two faculty members. It is not very impressive, however, to note that his program would serve the following groups of students: graduate biochemistry majors, graduate students in related areas, professional students in dentistry, veterinary medicine, and possibly medicine and undergraduate students in agriculture, education, and home economics. These students for the most part are presently being served by the Department of Physiological Chemistry, though perhaps not as completely as is desired. Additional staff members in both departments would be highly welcomed. It appears to me that the change in the departmental name is an unrelated issue.

"I have found what I would consider several inaccuracies in the statement. In addition to the lengthy discussion of the status of biochemistry on the campus which I feel is unrelated to a change in name he states that 'the proposed change in name would not encroach on the domain or functions of any other departments of the university'. Earlier in the statement he has indicated that the program outlined by him would serve 'professional students in dentistry, veterinary medicine, and possibly medicine'. This appears to me to be a direct conflict with the function of our Department of Physiological Chemistry. Another statement 'there is little historical reason to believe that the Department of Chemistry or the Department of Physiological Chemistry and Pharmacology are particularly anxious to move into the area of general

education and research in biochemistry as envisioned by the Department of Agricultural Biochemistry. Traditional medical biochemistry groups have not felt it desirable to engage in a general educational function in biochemistry'. It appears to me that these statements are grossly inaccurate as our Department has consistently trained doctoral candidates in Physiological Chemistry many of whom have gone into the profession in areas not related to medicine."

11. Comment of Professor B in this department:

"The last two sentences of the second paragraph, page 5, (Dr. Deatherage's report) make the point that the gap between the classical approach to the education of biologists, and the modern approach which involves the area of molecular biology, must be bridged. He emphasizes the role of biochemistry in bridging this gap. I could hardly agree with anything more. However, the gap must be bridged by a situation in which the research programs of all the departments concerned are readily available to each other, to affect the cross-fertilization that is so necessary. Simply changing the name of Agricultural Biochemistry to Biochemistry will do nothing to achieve this, on this campus . . . . . On page 8 (paragraphs 2-5) Dr. Deatherage states that the program in biochemistry at this University should be a broadly integrated academic program and should serve graduate students in biochemistry and related areas as well as professional students in dentistry, veterinary medicine, and possibly medicine. He makes a plea for a greatly enlarged biochemistry program, including the addition of several staff members and a greatly expanded physical facility. Again, I agree wholeheartedly, but I fail to understand why he states that this program should serve dentistry, for example, but possibly not medicine. Judging from the few opportunities I have had elsewhere to observe, I would expect a department of biochemistry that is in either the College of Medicine or a College of Arts and Sciences or Life Sciences, to be more acceptable to, and better able to serve all concerned, including medical students, than would be a department that is housed in the College of Agriculture. . . . . The statement is made, on page 14, that the Department of Physiological Chemistry and Pharmacology has not attempted to move in the area of general education and research needs, and has not felt it desirable to serve a general educational function in biochemistry. This cannot be substantiated by the present activities of our medical biochemistry group. In fact, it is my understanding that several of the faculty would prefer to use the 'general educational program' provided by the Department of Physiological Chemistry, in preference to that provided by the Department of Agricultural Biochemistry.

"A portion of the spirit of Dr. Deatherage's plea is that the name Agricultural Biochemistry signifies to people that the department is concerned with analyses of, and chemistry of feeds, fertilizers, pesticides, etc. For example, in his general summary, in the last two paragraphs on pages 15 and 16, he comes back to the point that the name of his department does not indicate its function, and that it is misunderstood by many on this campus as well as elsewhere. He further points out that the University is not abreast of comparable institutions elsewhere, in the area of biochemistry. He makes a plea that the nature of the role of biochemistry is such that it be dealt with more adequately at Ohio State University, as a realistic approach toward elevating biosciences generally. I agree wholeheartedly. I agree, also, that the name Agricultural Biochemistry is long since outmoded and that we have no business continuing with a department so titled. I insist, however, that our academic climate, so far as it concerns modern biology,

and in which biochemistry surely plays the hub role, cannot be materially improved merely by changing the name of a department from Agricultural Biochemistry to Biochemistry. Such a change is not even a step in the right direction. In fact, if we were to change the name, it may let us settle back, complacently feeling that we are now proceeding properly, and delaying decisions that really get at the heart of our problem . . . . . Incidentally, I understand that Dr. Garrett is seeking authorization to organize a division of biochemistry in the Chemistry Department. In my mind, this is complete nonsense, and would simply add one more impediment to the eventual solution of our problem, namely, elevating biochemistry to its proper position and role in bioscience education and research at this University."

12. Concluding Statement

Again, the above general comments on the ABC proposals are intended to clarify certain apparent misunderstandings of ABC concerning our own department. Actually many of the proposals in the ABC report are excellent, and we would be the first to go along with them in an integrated program of biochemistry on the campus. Such a program, however, would have to be planned mutually by the departments and not by a single department.

III. SUGGESTIONS FOR THE FUTURE PLANNING OF BIOCHEMISTRY AT THE OHIO STATE UNIVERSITY

A. A Single Unified Department of Biochemistry

Most of the faculty of PC feel that a single unified department of biochemistry on this campus is to be desired and should be planned for the future. Such a department can better plan and integrate its programs than to attempt to do this in two or three separate departments. The immediate difficulties of this re-organization are many, - the wide distance between the physical facilities of PC and ABC and the wide differences in the character of the teaching programs, both professional and otherwise. These make an immediate re-organization nearly impossible.

B. Future Building for the Unified Department

We do not have at hand any details of Dr. Deatherage's proposed new building. However, his estimate of total space seems to be fully adequate. Placement of the proposed building very close to the present Health Center also seems satisfactory. Any important separation from the Health Center would seem undesirable. The planning of a unified department, if established as university policy, naturally should be done by the faculties of both departments.

C. Faculty of the 'Department of Biochemistry'

It would be assumed that the present senior staff of both departments would be combined and serve as a nucleus for expansion to at least double the present combined senior staff. Dr. Deatherage's estimate of an eventual senior staff faculty of some twenty-two full-time members seems adequate and acceptable. On the other hand, to this faculty of the new department should be added, through courtesy appointments, all Ph.D. biochemists on the campus who desire this academic association. These courtesy appointees should be above and beyond the full-time staff of the department.

D. Program of the 'Department of Biochemistry'

Since there are a number of groups on the campus who require basic courses in biochemistry more or less patterned to the needs of these groups, the program of the new department should take these needs into full account. For purposes of future consideration the following groups should be serviced:

1. The College of Medicine

The emphasis here of course will be human biochemistry with the coverage of certain phases of clinical biochemistry in illustration of basic biochemical concepts. Refresher courses in the clinical years should be considered. Integration with other preclinical subjects should be studied.

2. College of Dentistry

Most first-year dental students have only two years of training in chemistry; hence, a modified basic course in biochemistry is desirable, with emphasis on the fundamentals of nutrition.

3. College of Veterinary Medicine

(No special comment)

4. Other Undergraduate Groups

Undergraduate majors in many of the departments of the College of Agriculture, the College of Arts and Sciences, and perhaps even other groups should be taught courses in biochemistry patterned to the needs of the general group in question. A general basic biochemistry course may be required to service many of these individuals. Thus presently many such take our undergraduate sequence, Physiological Chemistry 611-12-13, and doubtless many such take ABC's sequence in fundamental biochemistry.

5. Undergraduate Major Program in Biochemistry

A unified undergraduate major program leading to the B.S. or B.A. degrees in biochemistry should be planned by the new department. This could be along the line of the major program in PC or the program presently in ABC in the College of Agriculture. It is presumed that these degrees will be granted in the College of Arts and Sciences as they are at present in PC.

6. Graduate Program in Biochemistry

A graduate program embodying the best features of the present programs of PC and ABC should be planned for the new department. This planning should be done in close cooperation with the Department of Chemistry. A certain number at least of the graduate faculty of the new department and the Department of Chemistry should be mutually interchangeable so that conceivably a graduate student in biochemistry could work under a chemistry professor interested in biochemical aspects of his research or a graduate student in chemistry could be preceptored by a member of the staff of the new department in the departmental laboratories. For example, the writer of this report has advised graduate students both in ABC and in the Department of Chemistry.

D. Placement of the 'Department of Biochemistry' Budgetwise

It is the opinion of our faculty that the new department should be placed budgetwise in the College of Medicine. One reason for this opinion is that biochemistry is more significantly and comprehensively related in its service and research functions to the health sciences than it is to the agricultural sciences, important as this latter is. Thus, the future advances in medicine, dentistry, and the other health sciences will be the most significant outcome of application of the discipline of biochemistry to the general benefit of the health of mankind. Another reason for the close relationship of this department to the health sciences is the favorable prejudice toward securing grants from the National Institutes of Health, the National Science Foundation, etc., etc. A third reason for our opinion that the new department should be in the College of Medicine is that the members of the present PC staff are stimulated by and enjoy close association with the health sciences. In this connection the hospitals of the Health Center afford invaluable laboratory material for fundamental research in biochemistry. Some members of the ABC staff have indicated in the past their desire to participate in this association.

E. When Should the Unification of Biochemistry Take Place

It seems almost impossible under present space allocations and distances between buildings to accomplish much in the way of unification until the two departments can get together as one in a new building. Our teaching programs are entirely different timewise, our teaching assistants and fellows have different schedules, etc. One suggestion that has been made is the possibility of the organization temporarily at the graduate level of an Institute of Biochemistry. This is a possibility but also offers many problems. It would seem important first to establish a committee to look forward to the unification, to the planning of new building facilities, and to attempting gradual interrelation of graduate programs. I shall not attempt any further suggestion at this point.

IV. STATUS OF PHARMACOLOGY

Unification of Biochemistry will require separation of Pharmacology from PC, presumably as a new department. In case PC vacated Hamilton Hall some 20,000 square feet of building space would be available for pharmacology.

V. THE PROPOSAL OF ABC FOR CHANGE OF NAME

Replying to the request for change in name there are a number of reasons why members of the PC staff generally feel any change for ABC is inadvisable until such time as the future of biochemistry on this campus is established by policy. In effect there are presently two departments of biochemistry on the campus. Any change in the name of one of these departments to "The Department of Biochemistry" implies that the department in question is indeed <u>the</u> department of biochemistry. We would hope that the change in name therefore would be deferred until such policy is established.

SUGGESTED COURSES FOR PARTIAL FULFILLMENT FOR GRADUATE DEGREES IN PHYSIOLOGICAL CHEMISTRY

Master's Degree

Foreign Language. A reading knowledge of one foreign language is required, either French, German or Russian.

Required Courses.

Physiological Chemistry 611, 612 and 613 or 601, 602, 609 and 610, or equivalent. Above courses, excepting 613, are not available for graduate credit for students majoring in physiological chemistry.
Physiological Chemistry 815. Registration in this seminar is required. A total credit of 9 hours is permitted for both degrees.
Physiological Chemistry 950. Sufficient credit for a M.Sc. thesis.
Chemistry 841, 842 and 843. (Advanced organic.)
Chemistry 660 (qualitative organic) 3 hrs.
Chemistry 742 (quantitative organic) 4 hrs.

Elective

Chemistry 729 (spectrophotometry) 3 hrs.

Doctor of Philosophy Degree

Required Courses.

Physiological Chemistry 821, 822 and 823 (9 hrs.).
Physiological Chemistry 825 (2-4 hrs.).
Physiological Chemistry 815 (see above).
Physiological Chemistry 950. Sufficient credit and effort for Ph.D. thesis.
Chemistry (physical) 681, 682, 683, 691, 692, 693 or equivalent. An additional course in physical chemistry, 2 hrs. or more, is recommended.
Chemistry (organic lab.) 6 hrs. from 801, 802, 803, 844, 845.

Elective

Physiological Chemistry 614, 618, 812, 813, 898.
Agricultural Biochemistry 806, 807, 808.
Chemistry 860.

Language

A reading knowledge of a second foreign language.

Biological Requirements.

The biological requirements may be met by any of the following:
(a). Successful completion of first year in Medicine.
(b). Fifteen hours in courses carrying graduate credit (600 level and above) in botany, zoology or anatomy, or any acceptable combination of courses in two of these departments.
(c). An advanced sequence of courses in physiology (601, 602 and 5 additional hours elective, or 724, 725, and 726).
(d). Fifteen hours in bacteriology to be selected from the following group, or equivalent: 607, 622, 623, 635, 638, 649.
(e). An acceptable sequence in pharmacology, covering one year.

The program for the Ph.D. candidate is an individual matter and cannot be outlined in advance in terms of required courses beyond certain fundamentals which have been indicated above.

THE OHIO STATE UNIVERSITY
DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY
VIVIAN HALL, 2121 FYFFE ROAD
COLUMBUS, OHIO 43210
February 9, 1962

Dr. Frederic Heimberger
Vice President, Instruction and Research
Chairman, Council on Instruction
Administration Building
Campus

Dear Dr. Heimberger:

Thank you for sending us a copy of Professor J.B. Brown's letter and memorandum of February 1. We are pleased to have the opportunity to comment on his report entitled "Biochemistry at the Ohio State University" which is in reply to our presentation to the Council on Instruction on December 11 relative to our request for a change in name of our department.

We are pleased to note that Professor Brown concurs in many of the ideas we presented to the Council and he agrees to four of the five general recommendations we made to the Council -- the one exception is our change in name. We do regret, however, that it appears that he has misunderstood the nature of our report. We, the Department of Agricultural Biochemistry, no less than Physiological Chemistry, our respective colleges, and indeed the University, must accept equally the responsibility for deficiencies in biochemistry on the campus. Our remarks on December 11 were in no way intended to deprecate the Department of Physiological Chemistry. In fact I would have considered it quite inappropriate to have included any direct reference to any other than our own group in our presentation to the Council. As a chairman of a department of biochemistry, I feel that it is my responsibility to point up to the University administration ways whereby it can promote the growth of biochemistry and where, within our own University, we can remove an obstacle to the growth of biochemistry. It is in this perspective that we have made this request for a change in name of our department.

We have requested only that this department should be known by what it is -- a Department of Biochemistry. We would hope that there is to be a single integrated biochemistry program here at O.S.U. (and Professor Brown agrees with us that this should be our goal). We would certainly expect that our group as well as Physiological Chemistry would be integral parts of the whole effort. Hence a change in name of our department would not in itself preclude any academic reorganization. Professor Brown requests that he hopes "the change in name therefore would be deferred until such policy is established" This is the same answer we received in our 1954 and subsequent requests, and during the interim many personnel changes have taken place, but yet the problem of proper identification is still with us.

I shall not give a point by point rebuttal to Professor Brown's memorandum, however, if the Council wishes me to meet with them on this matter again, I will be pleased to do so. I do feel, however, in view of the nature of his remarks that it is necessary for me to clarify the nature of my report.

Our request simply was for a change in name and nothing more. However, to document our case it was necessary to present as many pertinent facts as possible. In our report we pointed out that O.S.U. is generally not keeping pace with other schools, and so it was necessary to document our case accordingly with evidence of how biochemistry is handled elsewhere and quantitative comparisons of O.S.U. and other institutions. In order to clearly establish that we are in fact a department of biochemistry, it was necessary to describe our program in some detail, particularly when the point at issue was identification and we were indeed presenting evidence that we were being misunderstood on campus and also off campus. Since biochemistry programs at the graduate level cost money, it was necessary to get into the financial side of our request. Rather than be specific with other groups on the campus, we chose rather to state as objectively as we could and in as general terms as possible, what we consider an adequate biochemistry program for the Ohio State University might be. That Professor Brown concurs on the major points of our general proposal in terms of program and facilities is most gratifying.

We notice that Professor Brown interprets our statement that the study of biochemistry itself is primarily a subject for graduate study as meaning that we consider that biochemistry has no function at the undergraduate level. No such inference is warranted. We plainly state that we believe service courses are indeed an integral and necessary part of a biochemistry program in a comprehensive university. Our activities at the undergraduate level, including the need for proper counseling of students, our role in the new course Botany 690, etc., is ample evidence on this matter. I am sure that Professor Brown would not consider a student properly prepared for comprehensive study of biochemistry without being thoroughly familiar with organic, physical, and analytical chemistry, mathematics at least through the calculus, some area of biology, languages, etc., which would require almost all the time available to an undergraduate student. Hence our position that biochemistry itself is essentially a graduate study is sound; so also is our position that lower level biochemistry service courses can indeed contribute materially and constructively to a wide variety of academic programs.

Professor Brown in his rebuttal does not actually present any evidence bearing on the main points of our position, nor has he documented (other than opinion) his statements that the name of this department is not a deterrent to its growth within and from outside the University. We have presented tangible evidence to support our position and can produce much more if desired. We are pleased that he quotes one of his staff as follows: "... I agree, also, that the name Agricultural Biochemistry is long since outmoded and that we have no business continuing with a department so titled." This is also the

feeling of our department and this is the point at issue in our request and is the only point we are seeking to clarify. Once this is done all of us with increased vigor can work to the goal upon which we all agree -- an integrated biochemistry program on the campus.

We will be pleased to furnish any other information or meet with the Council and other interested parties on this matter.

Sincerely yours,

F. E. Deatherage
Chairman

FED/db

DRAFT

Proposal for Formation of a Department of Biochemistry in the College of Arts and Sciences

Biochemistry is a rapidly developing interdisciplinary area of knowledge based on the fundamentals of biology and chemistry. It is primarily a graduate study. Research problems of biochemical nature are faced at the frontiers of knowledge in medicine, microbiology, organic chemistry, pathology, physiology, veterinary medicine and all other life sciences. There is a need for developing the fundamentals of biochemistry and then working with them in the many areas of biological science. This poses organizational problems of developing close working relationships between a department of biochemistry and the other life science departments. The aim of this proposal is to create a basic department of biochemistry in the College of Arts and Sciences which will

1. Serve as a focal point for the development of the basic work in biochemistry.
2. Stimulate work in professional and applied areas.
3. Attract graduate students.
4. Attract government and foundation support.
5. Attract and hold quality staff.

History

As would be expected considering the nature of biochemistry, work has been pursued at The Ohio State University in numerous existing departments. Development of biochemistry at Ohio State was similar to that at other institutions with stress being placed first on the professional and applied aspects of the subject. In searching for answers to professional problems these researchers developed basic knowledge where none existed. Simultaneous basic knowledge was being developed in basic departments. Indications are that a rapid expansion is imminent in basic biochemistry because of new tools, techniques and concepts. Ohio State seems to be fortunately situated to take a significant role in this expansion if advantage is taken of the potentialities existing on campus. Interest has been heightened in the long established departments concerned with biochemistry and we must not forget that our only two members of the National Academy, Drs. Melville Wolfrom and Melvin Newman are organic chemists. More recent additions to our strengths in biochemistry are the development of the Institute of Nutrition and Food Technology and the Gnotobiotics Laboratory which are new developments giving opportunity for great expansion of biochemical work both basic and applied.

Two recent proposals reflect growing interest in biochemistry on campus; the repetition of a proposal to change the name of the Department of Agricultural Biochemistry to the Department of Biochemistry and the request by the Department of Chemistry to develop a Division of Biochemistry.

The present proposal is believed to be a more imaginative approach to the total problem of biochemistry at Ohio State.

The structure of this proposal is controlled by three basic concepts.

1. First, ideally a large unit of instruction and research, such as a college, can most effectively use its resources when all its energies are directed toward fulfilling its chief role. For example, the College of Medicine can be most effective if it concentrates its efforts toward training physicians, the College of Education toward training primary and secondary school teachers and College of Arts and Sciences on the teaching and expanding of basic knowledge.

2. Second, a department usually prospers most when administered in a college whose aims are the same as the aims of the department. In this environment the chairman's requests are not competing with requests from other departments more closely aligned with College aims. Uncommitted students can be competed for on an equal basis and the competition for graduate students is aided when the incoming student feels he will be identified with a college whose aim is similar to his own. Requests for support from government agencies and foundations are not looked on with as much suspicion when the aims of the department and college in which it is administered are the same. Ability to attract and hold quality staff is increased when the faculty member feels he is working in a college and department with aims similar to his own.

The most recent proposal for a change of name of the Department of Agricultural Biochemistry illustrates some of the problems and frustrations of this type. The report says: "In conclusion we have shown that the name of this department does not indicate its function and that it is misunderstood on campus, is misinterpreted off-campus, is hampering us in bringing good students here, is a hindrance for bringing in outside funds upon which our growth in graduate education depends and is an obstacle to recruiting and maintaining top quality staff for biochemistry."

3. Third, the interaction of all knowledge stimulates the growth of knowledge and, therefore, the administrative structure should encourage interchange of knowledge both between related basic areas and between professional and basic areas.

In a comprehensive University the problem is how to interrelate groups in order to develop an integrated undergraduate program, a top graduate and professional program and how to develop a system of productive communication between subject areas and between basic and professional areas. This proposal suggests the improvement of the latter by use of a new type of interdisciplinary appointment.

At present we use joint appointments on campus where people in related areas can serve two or more departments because of overlapping interests. The relations normally do not involve participation in course work, departmental committees or meetings. It is proposed that the interdisciplinary appointment be conceived of for people taking an active role in two departments in making such contributions and that the appointee be budgeted in two departments at a rate depending on the proportion of time contributed.

In summary, the proposal to create a new Department of Biochemistry in the College of Arts and Sciences is being made within the framework of the concepts that (1) a college is most effective when directing its aim toward a well defined objective, (2) a department is most prosperous developing in a College with the same aims, and (3) administrative structure should encourage interchange of knowledge between related basic areas and between professional and basic areas.

Problems of defining basic and professional spheres

The problem of defining basic and professional spheres of operation is not difficult at the extremes but where they come together it becomes difficult. In some areas the limits have been sharpened by licensing. Except for the legal aspects the fact that there is a conflict should not be of great concern. Past experience has shown that in some subjects knowledge developed in the theoretical areas first and then was applied. In other subjects the reverse has been true. In a university this is no less true and conflicts will undoubtedly continue to develop as the man working in basic research occasionally impinges on the applied or professional areas and the professional man is driven into basic research to solve one of his problems. Such infringements should be encouraged in developing knowledge. Periodically re-alignments for the most efficient teaching of knowledge and for more efficient operation need to be made.

A recent example of this problem is the experience in geodetic science. For years civil engineers have been concerned with the applied aspects of geodetic science. Plane and geodetic surveying, photogrammetric surveying and adjustment of observations and theory of errors were all areas in which they operated. During and since World War II the problems in surveying changed rapidly. The need for development of a new set of standards, instrumentation, and theories produced rapid development in photogrammetry and geodesy. A new type of scientist developed, strongly grounded in mathematics and physics, who was related to the civil engineer but still different from the engineer. The Ohio State University was a leader in this development. Geodetic science was developed in the Department of Geology because of the interdependence of geology and photogrammetry. As it developed it also moved away from geology. Recently separation from Geology was proposed. At this time re-evaluation of geodetic science was

requested by the Executive Committee of the College of Engineering. In a letter to Vice President F.W. Heimberger, Chairman of the Council on Instruction, the Executive Committee of the College of Engineering said:

"The Executive Committee of the College of Engineering acting in accord with the long established policy of the College of Engineering welcomes and endorses the establishment and strengthening of any basic science discipline upon which the applied science of engineering can be built. Also in accord with this principle and practice the College does not contest the placement of such basic-science disciplines in the College of Arts and Sciences.

"In like manner the Executive Committee of the College energetically endorses the converse position - viz., that those courses and programs which apply the sciences basic to engineering belong within the engineering disciplines."

This definition of the important relationship between basic and applied and the desire to maintain this relationship cause the Executive Committee of the College of Engineering to question the establishment of a Department of Geodetic Science. Spheres of operation were clearly defined and the Department of Geodetic Science came into existence. Since then certain questions of possible overlapping courses have been discussed and as a result of conferences and patient working together the problems are being solved. In the long run a strong basic department in Arts and Sciences and a strong applied division or department in Engineering is to the best interest of the University.

There seems to be some similarity between the geodetic science problem and the biochemistry problem. With patience and goodwill this also should be amenable to solution.

Relationship to basic departments

Chemistry

The Chemistry Department has five men (Wolfrom, Cava, Newman, Finnegan and Van Winkle) working in the fields of natural-products synthesis and protein-property characterization. Several years ago Abeles, a fine young biochemist, was added to the staff. He left this year to take a position at Michigan because he felt there was limited opportunity for development of basic biochemistry at The Ohio State University. Discussion of expansion of biochemistry in the Department of Chemistry has been going on since then. Recently a proposal for expansion was submitted by Alfred B. Garrett, Chairman of the Department of Chemistry, to the Dean of the College of Arts and Sciences, the Dean of the Graduate School, and the Council on Instruction. The proposal from the Chemistry Department is one which would expand our commitment to basic biochemistry but would not

greatly improve the relationship between the other units on campus interested in biochemistry, i.e., Agricultural Biochemistry, Physiological Chemistry and Pharmacology, Institute of Nutrition, Gnotobiotic Laboratory and the Biophysics Institute.

In contrast to the Chemistry Department proposal this proposal would create a new Department of Biochemistry in the College of Arts and Sciences and instead of adding one or two men to the Department of Chemistry, trained in modern biochemistry, it proposes that they be members of the Department of Biochemistry.

The Department of Chemistry is also planning to add "new men in analytical, inorganic, physical and radiochemistry, a part of whose research programs is bordering on or in the field of biochemistry." To insure close working relations between the Department of Chemistry and the Department of Biochemistry it is proposed that some of these men be given interdisciplinary or joint appointments in the two departments. To achieve the same end it is proposed that members of the present staff of the Department of Chemistry most closely allied to the new Department of Biochemistry be given interdisciplinary or joint appointments as appropriate to their contributions.

The many studies in biochemistry using microorganisms have brought these two areas of study closer together and opened up new fields of research in microbiology. It is proposed that present and future members of the department doing basic teaching or research in biochemistry be given interdisciplinary or joint appointments in the Department of Microbiology and Biochemistry as appropriate.

Relationship to Professional Departments

Physiological Chemistry

The Department of Physiological Chemistry in the College of Medicine has been doing biochemistry related to medical problems for years. It is proposed that any present or future members of the department doing basic teaching or research be given interdisciplinary or joint appointments in Physiological Chemistry and the Department of Biochemistry as appropriate.

Agricultural Biochemistry

It is proposed that staff members working in basic biochemistry be given interdisciplinary or joint appointments in the new Department of Biochemistry as appropriate.

Relationship to the Institute of Nutrition and Food Technology and the Gnotobiotics Laboratory

Staff members of the Institute of Nutrition and Food Technology and the Gnotobiotics Laboratory doing basic biochemical research or teaching will be given appropriate interdisciplinary or joint appointments in the new Department of Biochemistry.

Other basic departments of biological science

Men working in other biological science departments on essentially biochemistry problems will be given interdisciplinary or joint appointments in the Department of Biochemistry as appropriate.

Summary

The report proposes creation of a basic Department of Biochemistry in the College of Arts and Sciences. It is hoped that this department will bring into focus the basic work now in progress on the campus and complement the professional work. It is hoped that this Department will answer the need for expansion in biochemistry felt in the departments of chemistry and microbiology.

To achieve these aims the proposal suggests a staff composed of the following to begin with.

1. The biochemists proposed by the Chemistry Department in their proposal for a division of biochemistry.

2. Any other staff members in related departments whose work is entirely basic biochemistry who wish to be transfered and for whom a transfer seems appropriate.

3. Interdisciplinary appointments for staff members in basic departments and professional departments who are engaged in part time teaching of basic courses or part time basic research in biochemistry who would like affiliation with the new department.

4. Joint appointments for staff members of other departments who are interested in biochemistry.

Inplementation

If approval is given to this proposal a committee will be appointed to search for a chairman of this department. His first charge will be to work out the course pattern for the program and plan the organization of the Department.

It is desirable that this basic department be close to the departments of chemistry and microbiology. The Chemistry Department feels that space can be found in the War Research Building or in the Chemistry Department to house the new department at the beginning of its operations.

THE OHIO STATE UNIVERSITY
DEPARTMENT OF AGRICULTURAL BIOCHEMISTRY
VIVIAN HALL, 2121 FYFFE ROAD
COLUMBUS, OHIO 43210

February 9, 1962

Dr. Frederic Heimberger
Vice President, Instruction and Research
Chairman, Council on Instruction
Administration Building
Campus

Dear Dr. Heimberger:

Dean J. Osborn Fuller of the College of Arts and Sciences has sent to us his proposal for the establishment of a Department of Biochemistry in that college. His proposal and the memorandum of Professor J. B. Brown apparently arise from our request for a change in name of our department. Perhaps it is these responses which more than any other evidence supports that we are on sound ground in pointing up the need for growth in biochemistry and that one way to do it is to be known as the Department of Biochemistry. It is good to have their reactions before us.

Before Dean Fuller submitted his proposal to the Council he visited me in my office and showed me a draft of his intended proposal and his thinking behind it. We had a very helpful discussion during which time I reiterated some of the thoughts which I expressed during our meeting with the Council. I believe it would be appropriate for me to comment on Dean Fuller's request. Professor A. B. Garrett of the Department of Chemistry sent me a copy of his proposal, but since his proposal is superseded by Dean Fuller's, I shall address myself only to Dean Fuller's "Proposal for Formation of a Department of Biochemistry in the College of Arts and Sciences".

In proposing a Department of Biochemistry for the College of Arts and Sciences, Dean Fuller is requesting a third University biochemistry department and that such a department should be outside of the Department of Chemistry. We believe that he is on sound ground in keeping biochemistry as a separate department rather than having biochemistry as a division of the Department of Chemistry. Historically, strong departments of biochemistry have developed independently of departments of chemistry. Only a relatively minor part of biochemistry in the United States is taught in departments of chemistry. We believe Dean Fuller is on unsound ground when he requests a third department of biochemistry should be established on the campus. This, it seems to us, is hardly the way to strengthen biochemistry here at O.S.U. A third department will dilute the efforts of the faculty, deplete effective financial resources, and undermine academic standards.

With three disjointed groups on the same campus giving degrees in the same subject, standards are inevitably lowered to the lowest quality department. What is really needed is one strong integrated program in biochemistry, but under present administrative organization it seems more appropriate to encourage the two departments of biochemistry, departments already in existence.

As we study Dean Fuller's proposal, he apparently is not aware that biochemistry has a hard basic disciplinary core of knowledge and that the program of our department is addressed to this core. Furthermore, it must be kept in mind that biochemistry is the meeting ground of chemistry and biology. Biochemistry is not just applicable to microorganisms but to higher plants and animals and to all areas of both basic and applied biology. Hence a biochemistry group must be organized and function with intercourse with all these areas.

We are pleased that Dean Fuller realizes that biochemistry should have a much more prominent place on the campus and that he accepts this tenet of our report to the Council on Instruction. He realizes, also, with us that we do have some resources in this field on the campus and that they might be better coordinated. We regret his apparent lack of appreciation of the nature of our program in general biochemistry and the efforts of our staff. He has also recognized the importance of joint appointments, a practice long recognized by both Professor J.B. Brown and myself in particular.

Our request to the Council is simply a request to change the name of this department. It is not our province of authority to reorganize the University, but we are obliged to point up to the University administration ways and means for academic growth in the areas of our responsibility. We sincerely regret that Professor Brown and particularly Dean Fuller addressed themselves to organization matters rather than directly to the merits of our request. For this reason I believe it is almost required that I comment on this matter raised by them.

As I indicated in my request to the Council, biochemistry developed in colleges of agriculture and later in colleges of medicine. Perhaps it is significant that the first great and productive research and educational program in biochemistry in the U.S.A. was that which came at the turn of the century by the cooperative efforts of Osborne of the Connecticut Agricultural Experiment Station and Mendel of Yale Medical School. From this point developed three very productive departments of biochemistry in Colleges of Agriculture at Cornell, Minnesota and Wisconsin and the Medical Schools at Harvard, Columbia and Johns Hopkins. The Cornell group is perhaps best known for the great scholars and scientists, L.A. Maynard, nutrition, and J.B. Sumner, an outstanding pioneer who was awarded a Nobel prize for his classical work

on the nature of enzymes. It was Sumner's concept which really unlocked the door for the development of modern biochemistry of the past three decades. Minnesota became known for their outstanding teachers, Bailey and Gortner, who gave the first classical texts in general biochemistry. Wisconsin had Babcock and then such outstanding men as E. V. McCollum (vitamin A) who later went to Johns Hopkins, Steenbach, Peterson, Phillips, Link and Elvehjem, who built the world's most productive department of biochemistry in both research and teaching and contributed a large share of the basic knowledge on which modern nutrition is based. Such men as Mendel of Yale, Folin, Benedict, Sherman and Hawk made a great impact on the development of biochemistry in medicine. Today creative teaching and research in biochemistry is not limited to a particular kind of university, a particular kind of college, or a particular kind of department. As I indicated in my report to the Council, 60 biochemistry departments in colleges of medicine account for no more than 1/4 to 1/3 of the Ph. D.'s in biochemistry in the U.S.A. It is of interest that of these 60 departments 25 are headed by men having their biochemistry training in colleges of medicine, 14 in colleges of agriculture, and 19 in foreign universities and other groups. Twenty-two biochemistry departments in colleges of agriculture account for one half of the total Ph. D.'s in biochemistry. The directors of 19 of these groups were trained in biochemistry departments in colleges of agriculture and 3 in colleges of medicine (including me). As one reflects on these groups and the different kinds of universities they represent, it is clear that there is no set pattern of organization in relation to effective educational programs in biochemistry. So perhaps it is fair to say that science and other forms of knowledge will grow wherever they find fertile fields. About all that can be said is that if in a comprehensive university, a division houses a fundamental area of knowledge, such as biochemistry, it can be made the responsibility of the division to serve the educational needs of all the university. By the same token, if a particular division of a university is to receive and control the educational programs of large numbers of non-committed students, it is the responsibility of that division to see that up-to-date programs of study of all units of the university are made available to all the students who have entrusted their educational future to that division. It seems to me that these guiding principles must be the common denominator for the three basic concepts upon which Dean Fuller bases his request for a new department.

As I indicated to the Council, we have, through formal and informal means, made numerous attempts to try to work out understandings within various groups pointing toward an integrated biochemistry program which would eliminate duplication of effort and permit the University to present a unified front concerning biochemistry both within and outside the University. (We can document this if you wish.) Now in view of Dean Fuller's

recommendations for implementing his proposal, and in view of Professor Brown's apparent acceptance of our proposition that the University work toward a goal of a broad integrated program in biochemistry, we wish to assure the Council that we will be most happy to work diligently with Dean Fuller, Professor Brown, Professor Garrett and any others concerned toward delineating the necessary steps to bring out a strong integrated biochemistry program at the Ohio State University. Other institutions have done it and so can we. (See the attractive brochure attached for Michigan State University.) It is opportune to get underway at once so that funds could be sought from outside sources to assist the University in building a centrally located facility. However, to get financial help either from federal or private sources, the University must show its enthusiastic support for an integrated biochemistry program.

If we can be of any further help to the Council on this matter we will be happy to do so.

Sincerely yours,

F. E. Deatherage
Chairman

FED/db

Appendix B

Courses of Instruction

and

Degree Programs and Requirments

1884 - 1969

(Years noted on left side of page is the first calender year of the academic year. For example 1884 means academic year 1884-85 and so on.)

1884- Agricultural Chemistry - First Year
Lectures - Autumn - Elements of Chemistry;
2 or 3/wk - Chemistry of Non-Metals
Winter - Organic Chemistry
Spring - Applications of Chemistry to Agriculture
Laboratory - Autumn - Qualitative Analysis
8 hrs/wk Winter - Qualitative Analysis
Spring - Quantitative Analysis - Salts, Minerals, Manures, Fertilizers, Water, and Feeding Stuffs
(For both regular degree and 2-yr. short course students)

1886- Agricultural Chemistry - First Year (as above)

Agricultural Chemistry - Third Year
Lectures - Applications of Chemistry to Agriculture
2/week - All year
Laboratory - Advanced Analytical Work Pertaining
3-2 hr/wk to Soil, Water, Fertilizers, Manures, Feedstuffs, Milk, Butter, Cheese, etc.

1891 Ag. Chem. 1. Principles of Chemistry and Chemical Nomenclature - Non Metals and Qualitative Analysis - Autumn-
Five class meetings per week. Required of all freshmen in engineering, veterinary medicine, medicine, and short course students in agriculture.

Ag. Chem. 2. Organic Chemistry. 2 lectures per week, and Qualitative Analysis 3 laboratories per week. Winter
Applications of Chemistry to Agriculture
2 lectures per week and Quantitative Analysis, 3 laboratories per week. Spring
Required for students in veterinary medicine and for students in short course in agriculture.

Ag. Chem. 3. Analytical Chemistry, 5 laboratories per week. Winter
Required for all freshmen in engineering

Ag. Chem. 4. Agricultural Industries. 2 lectures per week.
Quantitative Analysis
3 laboratories per week. Autumn
Quantitative Analysis. 5 laboratories per week. Winter
Quantitative Analysis, 3 laboratories per week. Spring
Required of sophomores and juniors in agriculture.

Ag. Chem. 5 Same as Ag. Chem. 4 except for juniors.

1892 Ag. Chem. 6 Senior Course. - Elective. Lectures and laboratories. 5 meetings per week.

1894 Ag. Chem. 7 Milk Chemistry and Milk Testing. Required for all students in 12 week short course in dairying.

1898 Ag. Chem. 2, Ag. Chem. 3, Ag. Chem. 5 dropped.
College of Engineering students go to Department of Chemistry.

Ag. Chem. 8. Organic Chemistry. 2 lectures and 3-2-hr. laboratories per week. Winter.

Ag. Chem. 9. Applications of Chemistry to Agriculture. 2 lectures and 3 laboratories per week. Spring.
(Freshman sequence for students in agriculture at this time became Ag. Chem. 1, 8 and 9, Ed.)

1900 Ag. Chem. - Special Course - Food Adulteration

1904 Ag. Chem. 1, 8 and 9. 6 credit hours
Ag. Chem. 10 Principles of Chemistry and Chemical Nomenclature. Lectures, recitations, and laboratory. 6 cr. hr. Autumn. Laboratory exercises from McPherson's Laboratory Notebook.

Ag. Chem. 11 Principles of Chemistry and Chemical Nomenclature. Lectures, recitations and laboratories. 6 cr. hrs. Winter. First half of term a continuation of Ag. Chem. 10; second half of term Weber's "Select Course in Qualitative Analysis", is used as laboratory guide.

Ag. Chem. 12 Organic Chemistry. Lectures, recitations, and laboratory. 6 cr. hr. Spring. Class work in elementary organic chemistry; laboratory, complete qualitative analysis of Ag. Chem. 11 and begin elementary quantitative analysis.

(Ag. Chem. 10, 11, 12 and Ag. Chem. 1, 8, 9 essentially equivalent sequences except 10, 11, 12 serves home economics students and 1, 8, 9 students in agriculture. Ed.)

Ag. Chem. 13 General Agricultural Chemistry. Lectures and Laboratory. 5 cr. hr. Autumn, Winter, Spring. 2 lectures and 3 laboratories per week. Lectures as in Ag. Chem. 9 (organic chemistry) but laboratory on industries related to agriculture, - such as sugar from cane, sorghum or beets; starch, glucose and dextrines; vinegars; alcohol, malt liquors and wine; etc.; Official Methods of Analysis for foods, feeds, fertilizers, etc.

Ag. Chem. 14 Domestic Science Chemistry. Lectures and Laboratories. Autumn, Winter. Course for Domestic Science students. Laboratory practice embraces as much as possible of the work in Ag. Chem. 13.

Ag. Chem. 15 Advanced. 4 cr. hr. Autumn, Winter, Spring. 4 laboratories per week consisting of official methods of analysis of soils, sanitary and complete water analysis, etc.

1905 Ag. Chem. 16, Applications of Chemistry to Agriculture 2 cr. hr. Spring. For short course students.

1906 Beginning this year, students in agriculture and home economics (domestic science) take their freshman chemistry in the Department of Chemistry. The courses in the department were revised somewhat, prerequisites were noted and new courses were added. The offerings of the Department became as follows:

Ag. Chem. 13 General Agricultural Chemistry. 5 cr. hr. 2 lectures and 3 laboratories per week. Prereq. Chem. 7 (2 quarters of Elementary Chemistry; Chem. 12 (qualitative Analysis) (f. Ag. Chem. 13 above)

Ag. Chem. 14 Domestic Science Chemistry. 5 cr. hr. Two quarters. Course in Domestic Science Prereq. Chem. 7, Chem. 12. (Cf. Ag. Chem. 14 above.)

Ag. Chem. 15 Industries Related to Agriculture. 4 cr. hr. Three quarters. Prereq. Ag. Chem. 13 or equivalent in quantitative analysis. (Cf. Ag. Chem. 15 above.)

Ag. Chem. 16 Same as above.

Ag. Chem. 17 Advanced Agricultural Analysis. 5 cr. hr. Three quarters. Intended for students desiring to specialize in agricultural chemistry.

Ag. Chem. 18 Food Inspection and Analysis. 3-5 cr. hr. Three quarters. Lectures on food composition and food adulteration. This course is designed to prepare for analytical work connected with the State Control of the sale of foodstuffs. Prereq. Ag. Chem. 13 or equivalent in quantitative analysis. Prof. Weber.

Ag. Chem. 19 Dairy Chemistry. 3-5 cr. hr. Three quarters. Intended for students specializing in Dairying and should be accompanied or preceded by a course in Dairying, Prereq: Ag. Chem. 13. Prof. Vivian.

Ag. Chem. 20 Chemistry of Soils. 3-5 cr. hr. Three quarters. Lectures and Laboratory classes. For students specializing in Agronomy. Prereq.: Ag. Chem. 13. Prof. Weber.

Ag. Chem. 21 Advanced Household Chemistry. 3-5 cr. hr. Three quarters. Prereq.: Ag. Chem. 14. Prof. Weber.

Ag. Chem. 22 Research. 5-10 cr. hr. Three quarters. Professors Weber and Vivian.

1908 Ag. Chem. 23 Chemistry of Animal Nutrition. 3-5 cr. hr. Three quarters. Prereq.: Ag. Chem. 13. Prof. Vivian.

"Courses 17 to 23 may be taken as graduate work if not previously elected or continued as special lines of research during a graduate course. Major graduate work may be taken along these or other lines included in Agricultural Chemistry".

1908 Soil Fertility Short Courses.

1909 Ag. Chem. 31 Chemistry of Foods 3-5 cr. hr. Prereq.: General and organic chemistry. Primarily for graduate students. Summer only. Associate Professor Lyman.

1909 Quarter system changed to semester system -
Equivalent courses: 102 = 16; 103 - 104 = 13; 105 - 106 = 17;
107 - 108 = 19; 111 - 112 = 23; 121 - 122 = 18;
123 - 12 = 14; 125 - 126 = 31; 131 - 132 = 22.

Ag. Chem. 102 Applications of Chemistry to Agriculture. 4 sem. hr. Second semester. Short courses in Agriculture and Horticulture. Professor Vivian.

Ag. Chem. 103-104 General Agricultural Chemistry. 5 sem. hr. The year. prereq.: Chemistry 106 or 110. Four year courses in Agriculture, Horticulture, and Forestry. Professor Vivian, Mssrs. Bear, Hendrix, Bennage, Boltz.

Ag. Chem. 105-106 Advanced Agricultural Analysis. 5 sem. hr. The year. Prereq. 103-104. Mr. Bear, Mr. Hendrix.

Ag. Chem. 107-108 Dairy Chemistry 3-5 sem. hr. The year. Prereq.: 103-104. Professors Vivian and Weber.

Ag. Chem. 109-110 Chemistry of Soils 3-5 sem hr. The year. For students specializing in Agronomy. Prereq.: 103-104. Professors Weber and Vivian.

Ag. Chem. 111-112 Chemistry of Animal Nutrition. 3-5 sem. hr. The year. Prereq.: 103-104 or equivalent. Professor Vivian.

Ag. Chem. 121-122 Food Inspection and Analysis. 3-5 sem. hr. The year. Prereq.: 103-104 or equivalent in quantitative analysis. Professor Weber, Associate Professor Lyman.

Ag. Chem. 123-124 Domestic Science Chemistry. 5 sem. hr. Course in Domestic Science. The year. Prereq.: Chemistry 106 and 127. Associate Professor Lyman and Assistants.

Ag. Chem. 125-126 Advanced Household Chemistry. 3-5 sem. hr. The year. Prereq.: 123, 124. Professor Weber, Associate Professor Lyman.

Ag. Chem. 131-132 Research. 5-10 sem. hr. The year. Professors Vivian and Weber, Associate Professor Lyman.

Courses 105-112 and 125-132 may be taken as graduate work, if not previously elected. Major graduate work may be taken in Agricultural Chemistry.

1910 Agricultural Chemistry is the only department in the College of Agriculture to formally list a graduate program.

1911 Graduate School begins.

1912 Ag. Chem. 125-126 Chemistry of Food and Nutrition 3-5 sem. hr. Prereq.: General and organic chemistry. A study of food principles, proteins, fats and carbohydrate. The composition of various tissues, secretions and excretions of the body; chemistry of digestion; the food requirements of the human body; effect of selected diets on metabolism. Laboratory work in preparation of food principles and a study of their chemical behavior. (This is a change in course. Ed.).

1914 Ag. Chem. 113 Chemistry of Insecticides and Fungicides. 2 sem. hr. Prereq.: 106 or 110.

1915 Ag. Chem. 51-52 Applications of Chemistry to Agriculture 4 sem. hr. The year. For students in the Agriculture Short Course.

Ag. Chem. 53 Chemistry of Plants 4 sem hr. Prereq.: 51 or equivalen For students in the Agriculture Short Course.

"Graduate Work"

"At least two years of work in chemistry is prerequisite for graduate work in Agricultural Chemistry. This work must include some preparation in general, organic and quantitative analysis.

"The following courses are open only advanced undergraduate and graduate students: 109, 110, 111, 112, 121, 122, 125, 126, 131, 132."

1916 The Department of Agricultural Chemistry and Soils. A change in name from the Department of Agricultural Chemistry.

Courses 103; 105-106; 107-108; 111-112; 113; 121-122; 123-124; 125-126; 51-52; 53 listed as above.

Soils

Ag. Chem. 152 Elementary Soils. 5 sem. hr. One semester. Prereq.: Ag. Chem. 103-104.

Ag. Chem. 153-154 Soil Fertility. 2 sem. hr. The year. Prereq.: Ag. Chem. 152.

Ag. Chem. 155-156 Chemical Analysis of Soils. 3 sem. hr. The year. Prereq.: Ag. Chem. 103-104; 152.

Ag. Chem. 157-158 Soil Physics and Soils Survey. 3 sem. hr. The year. Prereq. Ag. Chem. 103-104.

Graduate Work

Ag. Chem. 201-202 Research in Soils, 5-10 sem. hr. The year. Prereq.: Thorough training in chemistry.

1917 Ag. Chem. 114 Plant Chemistry 2 sem. hr. One semester. Two lectures per week. Prereq.: 103-104.

Ag. Chem. 116 Plant Chemistry 2 sem. hr. One semester. Two laboratory periods per week. Prereq.: 103-104; 114 or concurrent 114.

Ag. Chem. 157 Origin and Classification of Soils. 3 sem. hr. One semester. Prereq. 152.

Ag. Chem. 158 Soil Physics. 3 sem. hr. One semester, Prereq. 152.

1918 "A student may not elect more than 5 semester hours per semester in other colleges during the junior and senior years."

"All students intending to major in this department should consu Mr. Lyman or Mr. Bear for advice in outlining a curriculum. It is desirable that this consultation be held soon after admission to the College in order that the student may take best advantage of optional and elective privileges."

"Majors (graduate) may specialize in theChemistry of Animal Nutrition; Chemistry of Dairy Products; Chemistry of Fertilizers; Chemistry of Plant Life; Chemistry of Soils; and Food Inspection and Analysis.

1918 Ag. Chem. 159-160 Soils Literature 1 sem. hr. The year Prereq.

Ag. Chem. 161-162 Chemistry of Fertilizers. 1-4 sem. hr. The yea Prereq. 152.

Ag. Chem. 53-54 Elementary Soils. 3 sem. hr. The year. For students in the Agriculture short course.

Ag. Chem. 203-204 Soil Seminary. 1 sem. hr. The year. Required of all graduate students in soils.

1922 The University reintroduced the quarter system. A new course numbering system, which was to be retained until 1967, and point hour grading system were established.

Soils separated from the Department of Agricultural Chemistry and Soils and the Department returned to its original name.

1922 "The Department of Agricultural Chemistry"

"Professors Lyman, Assistant Professor Phillips, Miss Edgar, Mr. Almy, and assistants.

"Students expecting to major in Agricultural Chemistry are requeste to interview Professor Lyman concerning election of courses in this and related departments."

For undergraduates

Ag. Chem. 401 General Agricultural Chemistry. 5 cr. hr. One qua Three recitations and two 3-hour laboratories. Requi in standard courses in Agriculture and Horticulture. Prereq.: Chemistry 402 or 412. (Two quarters of ge chemistry). Mr. Almy.

Ag. Chem. 402 Household Chemistry. 5 cr. hr. Three lectures and two 3-hour laboratories. Home Economics, second year. Science Nursing, second year. Prereq.: Chemistry 402 or 412.(Two quarters of general chemistry.)

Ag. Chem. 403 Household Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Home Economics, second year, Science Nursing, second year, Prereq.: 402 Mr. Lyman.

For advanced undergraduates and graduates.

Ag. Chem. 601 General Biological Chemistry. 5 cr. hr. Three lectures and two 3-hour laboratories. Prereq. 401 or equivalent and junior standing. Not available to those with credit in Ag. Chem. 111, 114, 125.

Ag. Chem. 602 Food Inspection and Analysis. 5 cr. hr. One lecture and four 3-hr. laboratories. Prereq.: 401 or equivalent in organic chemistry and quantitative analysis. (Equivalent to old Ag. Chem. 121). Mr. Almy.

Ag. Chem. 603 Food Inspection and Analysis. 5 cr. hr. Continuation of 602. Prereq.: 602. (Equivalent to old Ag. Chem. 122).

Ag. Chem. 604 Dairy Chemistry. 5 cr. hr. One lecture and four 3-hr. laboratories. Prereq.: 401 and junior standing. (Equivalent to old Ag. Chem, 107).

Ag. Chem. 605 Dairy Chemistry. 5 cr. hr., One lecture and for 3-hr. laboratories. Prereq.: 401 and 604 suggested. (Equivalent to old Ag. Chem. 107).

Ag. Chem. 606 Advanced Dairy Chemistry. 5 cr. hr. One lecture and four 3-hr. laboratories. Prereq.: 605. Equivalent to old Ag. Chem. 108.

Ag. Chem. 607 Chemistry of Nutrition. 5 cr. hr. Two lectures and three 3-hr. laboratories. Prereq.: 601 or 403 and Physiology 403, 404 (General Physiology). (Equivalent to old Ag. Chem. 126).

Ag. Chem. 608 Animal Nutrition. 5 cr. hr. Two lectures and three 3-hr. laboratories. Prereq. 601 and Animal Husbandry 402. (Equivalent to old Agr. Chem. 112.)

For Graduates

Prerequisite: At least six quarters of work in chemistry is required as a prerequisite to graduate work in Agricultural Chemistry. This work must include acceptable courses in general, inorganic, organic and quantitative analysis.

Ag. Chem. 801 Plant Chemistry. 5 cr. hr. Lectures and laboratories arranged. Prereq.: 601 and consent of instructor.

Ag. Chem. 802 Special Problems. 5-15 cr. hr.

Ag. Chem. 803 Research.5, 10, 15 cr. hr.

Ag. Chem. 804 Seminary.1 cr. hr.

1924 Ag. Chem. 404 - Introductory Agricultural Analysis. 3 cr. hr. Three 3-hr. laboratories. Prereq.: 401 or 402.

1926 Ag. Chem. 701 - Special Problems. 5-15 cr. hr.

1927 Ag. Chem. 405 - Principles of Animal Nutrition. 3 cr. hr. Two lectures and one 3-hr. laboratories. Prereq.: Physiol. Chem. 401.
(Physiol. Chem. 401 was for first year dentistry students and second year veterinary students.)

1930 Ag. Chem. 603 - Food Inspection and Analysis. Discontinued.

1932 Ag. Chem. 406 - Animal Chemistry. 3 cr. hr. One lecture and two 3-hr. laboratories. Veterinary Medicine, second year. Prereq.: Three quarters of general chemistry and Ag. Chem. 401.

1935 Ag. Chem. 950 - Research 5, 10, 15 cr. hr. (Replaced Ag. Chem. 803).

Courses in the Department beginning in the 1935-36 academic year were as follows: 401, 402, 403, 406, 601, 602, 604, 605, 606, 607, 608, 701, 801, 804, 950.

1939 Ag. Chem. 402 Introduction to Organic and Biological Chemistry. (Title only changed from "Household Chemistry".)

Ag. Chem. 403 Introduction to Organic and Biological Chemistry. (continuation of 402 and title changed from "Household Chemistry").

Ag. Chem. 608 - Animal Nutrition. Discontinued.

1940 Ag. Chem. 610 Chemistry of Insecticides. 5 cr. hr. Three lectures and two 3 hr. laboratories. Prereq.: 401 and 15 cr. hr. of biological sciences.

1941 Ag. Chem. 501 Dairy Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq. 401, Chemistry 402 or 412.

Ag. Chem. 502 Dairy Chemistry 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 501.

Ag. Chem. 604 Advanced Dairy Chemistry.
(Change in title from "Dairy Chemistry").

Ag. Chem. 605 Advanced Dairy Chemistry
(Change in title from "Dairy Chemistry").

Ag. Chem. 606 Advanced Dairy Chemistry. Discontinued.

1942 "For Graduates

"Requirements for the Master's Degree: (a) In Plant Chemistry: Course work must include one year of organic chemistry with laboratory; at least two quarters of physical chemistry with laboratory; Agronomy 602 or equivalent in quantitative analysis; and plant physiology, Botany 605 and 606; Agricultural Chemistry, 601 or equivalent. (b) In Chemistry of Food and Nutrition: Course work must include 12 quarter hours of organic chemistry with laboratory; Agricultural Chemistry 601, 602, 607; Zoology 609; two quarters of physical chemistry with laboratory. (c) In Food Analysis: Course work must include the following to be attained in previous undergraduate work or to be completed with other specifiec requirements for the M.S. degree before the candidate whall be considered eligible for the degree: Agronomy 602 or two quarters of quantitative analysis; Agricultural Chemistry 601, 602, 607; Bacteriology 607, 614; Chemistry (organic) 647, 648, 649, 650 (physical) 681, 682, 691, 692 or equivalent. (d) In Dairy Chemistry: Course work must include the following, to be attained in previous undergraduate work or to be completed with other specified requirements for the M.S. degree before the candidate shall be considered eligible for the degree: Agricultural Chemistry 601, 602, 604, 605; Bacteriology 607; Chemistry (organic) 647, 648, 649, 650, (physical 681, 682, 691, 692 or equivalents.

"Requirements for the Ph.D.; (a) In Plant Chemistry: Course work must include in addition to that for the Master's degree: a third quarter of physical chemistry with laboratory; Botany (physiological

methods) 632, 633, (plant microchemistry) 617; Agricultural Chemistry 607, 801; Chemistry (spectroscopy) 628, (qualitative organic) 641, (quantitative organic) 642. (b) In the Chemistry of Food and Nutrition: In addition to the M.S. course work must include: a third quarter of physical chemistry with laboratory; Chemistry (spectroscopy) 628, (qualitative organic) 641, (quantitative organic) 642; Bacteriology 607, 614; Physiology 626, 627; Anatomy 613, 616, 619. (c) In Food Analysis: In addition to the course work for the M.S. degree, course work must include Chemistry 628, 641, 695, 683, 693. (d) In Dairy Chemistry: In Addition to the course work for the M.S. degree, course work must include Agricultural Chemistry 607; Bacteriology 610, 611, 614; Chemistry 628, 641, 642, 695, 683, 693.

"At the end of the first year of residence all doctoral candidates must pass a departmental examination."

1945 Ag. Chem. 610 Horticultural Chemicals. 5 cr. hr.
(Name change from "Chemistry of Insecticides".)

Ag. Chem. 611 Chemistry of the Vitamins. 5 cr. hr. Three lectures and two 3- hr. laboratories. Prereq.: 601.

Ag. Chem. 612 Cereal Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 601.

1946 Ag. Chem. 613 Chemistry of Food Technology. 5 cr. hr. Three lectures and two 3-hr. laboratory. Prereq: 601 or 15 cr. hr. in Agricultural Chemistry.

Courses offered in the Department in the 1946-47 academic year were: 401, 402, 403, 406, 501, 502, 604, 605, 607, 610, 611, 612, 613, 701, 801, 804, 950.

1947 Ag. Chem. 612 Cereal Chemistry. Discontinued.

Ag. Chem. 613 Chemistry of Foods and Food Processing. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 601 or equivalent. Recommended Chemistry 647, 648, 680 or 681,
(Change in title from "Chemistry of Food Technology" and modification of prerequisites.)

Ag. Chem. 611 Chemistry of the Vitamins. 5 cr. hr. Discontinued and replaced by Ag. Chem. 621 and 622.

Ag. Chem. 621 Chemistry of the Vitamins. 3 cr. hr. Three lectures. Prereq.: 601, 607.

Ag. Chem. 622 Chemistry of the Vitamins. Laboratory 2 cr. hr. Two 3-hr. laboratories. Prereq.: 601, 621, or concurrent 621.

1948 Name changed from "Department of Agricultural Chemistry" to

Department of Agricultural Biochemistry

Courses structure in the Department was modified somewhat.

Ag. Biochem. 410 General Agricultural Biochemistry. 3 cr. hr. Three lectures. Prereq.: Chemistry 412.

Ag. Biochem. 411 General Agricultural Biochemistry: Laboratory 3 cr. hr. Two 3-hr. laboratories. Prereq.: Chemistry 412.

Ag. Biochem. 410 and 411 replaced Ag. Chem. 401.

Ag. Biochem. 501 Dairy Chemistry 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 410, 411, or equivalent.

Ag. Biochem. 502 Dairy Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq. 410, 411, or equivalent.

Ag. Biochem. 503 Essentials of Biological Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 410, 411.)Essentially replaces Ag. Chem. 402 and 403 which were discontinued.)

Ag. Biochem. 506 Animal Biochemistry. 3 cr. hr. Three lectures Prereq.: 410 or one quarter of organic chemistry and one quarter of quantitative analysis.

Ag. Biochem. 507 Animal Biochemistry: Laboratory. 2 cr. hr. Two 3-hr. laboratory classes. Prereq.: 410, 411 or one quarter of organic chemistry and one quarter of quantitative analysis: 506 or concurrent 506. (Ag. Biochem. 506 and 507 essentially replaced Ag. Chem. 406. discontinued.).

Ag. Biochem. 601 General Biological Chemistry, 3 cr. hr. Three lectures. Prereq. 410, 411 or equivalent in organic chemistry and 5 cr. hr. of biological science. (Ag. Biochem. 610 and 609 (see below) essentially replaced Ag. Chem. 601 discontinued).

Ag. Biochem. 602 Official Methods of Analysis. 5 cr. hr. One lecture and four 3-hr. laboratories. Prereq. 410, 411 or equivalent, (Replaces Ag. Chem. 602. "Food Inspection and Analysis", discontinued.)

Ag. Biochem. 604 Advanced Dairy Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 601, 609 or equivalent or fifteen credit hours in Agricultural Biochemistry.

Ag. Biochem. 605 Advanced Dairy Chemistry. 5 cr. hr. Three lectures and two 3-hr. laboratories., Prereq.: 601, 609 or equivalent.

Ag. Biochem 609 General Biological Chemistry. 3 cr. hr. Two 4-hr. laboratory classes. Prereq. 410, 411 or equivalent in organic chemistry and quantitive analysis, 601, or concurrent 601.

Ag. Biochem. 610 Horticultural Chemicals. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: Permission of instructor.

Ag. Biochem. 613 Chemistry of Foods and Food Processing. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 601, 609, or equivalent. It is recommended that student have or take concurrently Chemistry 647, 648, and 680 or 681.

Ag. Biochem. 621 Chemistry of the Vitamins. 3 cr. hr. Three lectures. Prereq.: 601, 607, 609 or equivalent.

Ag. Biochem. 622 Chemistry of the Vitamins: Laboratory. 2 cr. hr. Two 3-hr. laboratories. Prereq.: 601, 609, 621 or concurrent 621.

Ag. Biochem. 701 Special Problems. 3-15 cr. hr. Prereq.: 601 and 609 or equivalent.

Ag. Biochem. 801 Plant Chemistry. 5 cr. hr. Two lectures or discussions and three 3-hr. laboratories. Prereq.: 601, 609, and Botany 605 (Plant Physiology).

Ag. Biochem. 804 Seminar 1 cr. hr.

Ag. Biochem. 950 Research in Agricultural Biochemistry 5-15 cr. hr.

1949 Ag. Biochem. 507 Animal Biochemistry. Laboratory 3 cr. hr. Two lectures and two 2-hr. laboratories. (change from 2 cr. hr. to 3 cr. hr.).

1950 Ag. Biochem. 603 Analysis of Dairy Products. 5 cr. hr. Two lectures and three 3-hr. laboratories. Prereq. 601, 609 or 410, 411 or equivalent and twenty five credit hours in Dairy Technology. 602 recommeded.

Ag. Biochem. 604 Advanced Dairy Chemistry. Discontinued.

Ag. Biochem. 713 Chemistry of Foods and Food Processing (change in number from Ag. Biochem. 613).

Ag. Biochem. 721 Chemistry of the Vitamins. 3 cr. hr. (change in number from Ag. Biochem. 621).

Ag. Biochem. 722 Chemistry of the Vitamins. 2 cr. hr. (change in number from Ag. Biochem. 622).

Ag. Biochem. 805 Advanced Biochemical Preparations. 5 cr. hr. One lecture and three 4 hr. laboratories - - Prereq.: 609, Chem. 741 (qualitative organic).

Ag. Biochem. 806 Enzymes. 5 cr. hr. Three lectures and two 3-hr. laboratories. Prereq.: 601, 609 and acceptable courses in physical chemistry.

1952 Ag. Biochem. 503 Essentials of Biological Chemistry. Discontinued.

Ag. Biochem 604 Advanced Dairy Chemistry. Discontinued.

Ag. Biochem. 801 Plant Chemistry. 5 cr. hr. One lecture and four 3-hr. laboratories, (change from two lecture and discussion and three 3-hr. laboratories).

1954 Ag. Biochem. 899 Interdepartmental Seminar in Nutrition and Food Technology. 1 cr. hr.

1955 Ag. Biochem. 512 Official Methods of Analysis. 5 cr. hr. One lecture and twelve hours in laboratory arranged. Prereq. 410, 411 or equivalent.

Ag. Biochem. 602 Official Methods of Analysis. Discontinued.

Ag. Biochem. 603 Analysis of Dairy Products. Discontinued.

Ag. Biochem. 605 Advanced Dairy Chemistry. Discontinued.

Ag. Biochem. 607 Chemistry of Nutrition. Changed to 707. See below.

Ag. Biochem. 707 Nutrition and Introduction to Intermediary Metabolism. 5 cr. Three lectures and two 3-hr. laboratories. Prereq.: 601, 609 or equivalent and acceptable courses in physiology.

Ag. Biochem. 721 Chemistry of the Vitamins. Discontinued

Ag. Biochem. 722 Chemistry of the Vitamins. Laboratory. Discontinued

Ag. Biochem. 806 Intermediary Metabolism and Introduction to Enzymes. 5 cr. hr. Three lectures and two 3-hr laboratories. Prereq.: 707 (change in title from "Enzymes").

Ag. Biochem. 807 Special Topics in Proteins. 3 cr. hr. Three lectures. Prereq.: 806 and acceptable courses in physical chemistry.

Ag. Biochem. 808 Special Topics in Enzymes. 3 cr. hr. Two lectures or conferences per week. Prereq.: 807.

Ag. Biochem. 813 Special Topics in Food Chemistry. 2 cr. hr. Two lectures or conferences. Prereq.: 806 and acceptable courses in organic and physical chemistry.

Ag. Biochem. 898 Interdepartmental Seminar in Nutrition and Food Technology. 1 cr. hr.

Courses in the Department for the academic year 1954-55 were as follows: 410, 411, 501, 502, 506, 507, 512, 601, 609, 701, 707, 713, 801, 804, 805, 806, 807, 808, 813, 898, 899, 950.

"Requirements for the Master's degree: All candidates for the Master's degree must complete thorough training equivalent to an undergraduate major curriculum in chemistry. This must include a year's work in each of the fields of analytical, organic and physical chemistry with laboratory. The candidate must complete a year's work in biochemistry and acceptable courses in bacteriology, botany, or zoology related to the students particular interest. In addition other courses may be required in accordance with the area of biochemistry chosen by the student in consultation with his advisor.

"Requirements for the Ph.D.: In addition to the requirements for the master's degree, the candidate must complete a years work in organic and/or physical chemistry at the 800 level; at least one biological science through physiology a year's course work in biochemistry, and such other courses as may be necessary to support independent investigation in the area of biochemistry selected by the candidate in consultation with his advisor.

"In addition to the general examination for degrees and following the first quarter of residence all graduate students must take a general examination in inorganic, organic, analytical and physical chemistry".

Curriculum in Agricultural Biochemistry Leading to the Degree of Bachelor of Science in Agricultural Biochemistry

"Since biochemistry as such is primarily a graduate program the curriculum has been designed to prepare students for graduate work in this area. The biochemist must not only be a chemist but also a biologist, and furthermore, should have some idea of related fundamental and applied fields. Therefore, in planning the program emphasis has been placed on fundamental courses offering the student the broadest possible perspective. The curriculum is specifically designed for those interested in the chemistry of plants, animals and microorganisms as such and as it applies to problems in foods, nutrition, plant and animal production.

"The curriculum requires 210 hours for graduation.

"The following program of required courses is designed to provide the minimum requirements for the Bachelor of Science degree in Agricultural Biochemistry.

First Year

Chemistry (411)	5	Chemistry (412)	5	Chemistry (413)	5
Mathematics (416)	5	Mathematics (417)	5	Mathematics (418)	5
English (410)	3	English (411)	3	English (412)	3
Survey of Agriculture (401)	1	Physical Ed.	1 or 2	Elective	3
Physical Ed.	1	Military Air Sci.	2	Physical Ed.	1
Military or Air Sci.	2			Military or Air Sci.	2

Second Year

Chemistry (421)	4	Chemistry (422)	4	Chemistry (423)	4
or		or		or	
Chemistry (431)	5	Chemistry (432)	4	Chemistry (433)	4
Physics (411 or 431)	5	Physics (412 or 432)	5	Physics (413 or 433)	5
Mathematics (536)	5	Mathematics (537)	5	Botany (401)	5
Military or Air Sci	2	Elective	3	or	
Physical Ed. women	1	Military or Air Sci.	2	Zoology (401)	5
		Physical Ed. women	1	Elective	3
				Military or Air Sci.	2
				Physical Ed. women	1

Third Year

Chemistry (647 or 655)	3	Chemistry (649 or 657)	3	Chemistry 659	3
Chemistry (649 or 656)	3	Chemistry (650-658)	3	Chemistry 660	3
Agr. Economics (420)	5	French or German	5	or	
French or German	5	Bacteriology 607	5	Chemistry 741	4
Botany (402)	5	Economics 406	5	Agr. Biochemistry 601	3
or				Agr. Biochemistry 609	3
Zoology (402)	5			French or German	5
Elective	3 or 5				

Fourth Year

Electives	18	Agr. Biochemistry (607)	5	Electives	18
		Electives	13		

Electives must include:

10 hours. Botany 605, 606 or Physiology 601, 602, or 604, 605 or Bacteriology 633 and five additional hours of bacteriology.

5 hours. In addition to and beyond the required agricultural biochemistry courses above.

10 hours. Selected from the Departments of Animal Science, Agronomy, Dairy Science, Dairy Technology, Horticulture, and Poultry Science.

12 hours. Selected from the following areas or Departments of Economics, Classical Languages, English, Fine and Applied Arts, Geography, German, History, Journalism, Music, Philosophy, Political Science, Psychology, Romance Languages, Russian, Sociology, Speech.

1956 Ag. Biochem. 899 Interdepartmental Seminar in Nutrition and Food Technology. Discontinued. 898 is continued however.

1957 Ag. Biochem. 410 Introduction to Agricultural Biochemistry. Name changed from "Introduction to Biological Chemistry" by Council on Instruction without consultation of the Department.

Ag. Biochem. 411 Introduction to Agricultural Biochemistry: Laboratory. Name changed from "Introduction to Biological Chemistry: Laboratory" by Council on Instruction without consultation of the Department.

Ag. Biochem. 512 Official Methods of Analysis. Discontinued.

Ag. Biochem. 601 General Agricultural Biochemistry. Title of course changed from "General Biological Chemistry" by Council on Instruction without consulting the Department.

Ag. Biochem. 609 General Agricultural Biochemistry: Laboratory. Title of course changed from "General Biological Chemistry" by Council on Instruction without consultation with the Department.

Ag. Biochem. 806 Enzymes 3 cr. hr. Three lectures. (Title change from 'Intermediary Metabolism and Introduction to Enzymes" and lecture and laboratory portions separated. See 816 below).

Ag. Biochem. 807 Advanced Studies on Proteins and Nucleic Acids. 3 cr. hr. Three lectures. Prereq.: 806.

Ag. Biochem. 808 Advanced Studies on Enzymes. 3 cr. hr. Three lectures. Prereq.: 807.

Ag. Biochem. 816 Enzymes Laboratory. 3 cr. hr. One lecture and two 3-hr. laboratories. Prereq.: 806 or concurrent 806.

1958 Ag. Biochem. 410 Introduction to Biological Chemistry. Title change from "Introduction to Agricultural Biochemistry".

Ag. Biochem. 411 Introduction to Biological Chemistry. Laboratory. Title change from "Intoduction to Agricultural Biochemistry. Laboratory".

Ag. Biochem. 501 Dairy Chemistry. Discontinued.

Ag. Biochem. 502 Dairy Chemistry: Laboratory. Discontinued.

Ag. Biochem. 506 General Biological Chemistry. 3 cr. hr. Title change from "General Animal Biochemistry" and change in prerequisite to one quarter of organic chemistry with laboratory.

Ag. Biochem. 507 General Biological Chemistry: Laboratory. Laboratory. 3 cr. hr. Title change from General Animal Biochemistry: Laboratory and change in prerequisite to one quarter of organic chemistry with laboratory.

Ag. Biochem. 601 General Biological Chemistry. 3 cr. hr. Title change from "General Agricultural Biochemistry" and change in prerequisite to one quarter of organic chemistry with laboratory.

Ag. Biochem. 609 General Biological Chemistry. Laboratory. 3 cr. hr. Title change from "General Agricultural Biochemistry" and change in prerequisite to one quarter of organic chemistry with laboratory.

1959 Ag. Biochem. 506 Animal Biochemistry. Discontinued. Combined with 601.

Ag. Biochem 507 Animal Biochemistry Laboratory. Discontinued. Combined with 609.

Ag. Biochem. 613 Chemistry of Foods and Food Processing. change in number from 713.

Ag. Biochem. 713 Discontinued. See 613 above.

Courses in the Department for the academic year 1959-1960 were: 410, 411, 601, 609, 613, 701, 707, 804, 805, 806, 807, 808, 816, 898, 950.

1960 Ag. Biochem. 707 General Biological Chemistry. 3 cr. hr. Three lectures. Prereq.: 601. Change in name so as to form a sequence with 601. Laboratory separated to form 708 below.

Ag. Biochem. 708 General Biological Chemistry: Laboratory 3 cr. hr. Two 4 hr. Laboratories. Prereq. 609 and 707 or concurrent 707.

Ag. Biochem. 804 Seminar 1 or 2 cr. hr.

1961 All courses offered by the Department in 1961-62 follow with some revisions and modifications.

Ag. Biochem. 410 Introduction to Biological Chemistry. Discontinued in favor of new course 610. See below.

Ag. Biochem. 411 Introduction to Biological Chemistry. Laboratory. Discontinued in favor of new course 611. See below.

Ag. Biochem 610 Introduction to Biological Chemistry. 3 cr. hr. lectures. Prereq.: One quarter of organic chemistry (chemistry 408, 451, or 551). This course is not a prerequiste to other courses in biochemistry.

Ag. Biochem. 611 Introduction to Biological Chemistry: Laboratory. 3 cr. hr. Two lectures and two 2-hr. laboratories. Prereq. or concurrent: 610.

Ag. Biochem. 613 Chemistry of Foods and Food Processing. 5 cr. hr. Three lectures and two 3 hr. laboratories. Prereq: One quarter of organic chemistry and one quarter of quantitative analysis.

Ag. Biochem. 620 Biochemistry of Animal Function 3 cr. hr. Three lectures. Prereq.: Chemistry 451 or 551. For students in veterinary medicine, dietetics, and related disciplines.

Ag. Biochem. 621 Biochemistry of Animal Function: Laboratory. 3 cr. hr. Two 3-hr. laboratories. Prereq. or concurrent 620.

Ag. Biochem. 701 Special Problems. Prereq. Six quarter hours of biochemistry.

Ag. Biochem. 705 707 709 General Biological Chemistry. 3 cr. hr. each. Prereq.: Chemistry 647, 648, 649, 650, or 655, 656, 657, 658, or equivalent, and Mathematics 536. Chemistry 681 recommended. To be taken as a three quarter sequence.

Ag. Biochem. 706 708 710 General Biological Chemistry: Laboratory. 3 cr. hr. each. Prereq. or concurrent: 705, 707, and 709.

Ag. Biochem 804 Seminar 1 or 2 cr. hr.

Ag. Biochem. 805 Advanced Biochemical Techniques and Preparations. 3 cr. hr. One lecture and two 3-hr. laboratories. Prereq.: 710, Chemistry 660, or equivalent, Physics 634, permission of instructor.

Ag. Biochem. 806 Enzymes. Discontinued. Much of this course was put into 705, 707, and 709.

Ag. Biochem. 807 Proteins and Nucleic Acids. 3 cr. hr. three lectures. Prereq.: 709 or equivalent.

Ag. Biochem. 808 Enzymes. 3 cr. hr. Change in title only.

Ag. Biochem. 809 Carbohydrates. 3 cr. hr. Three lectures. Prereq.: 709; Chemistry 794 recommended.

Ag. Biochem. 813 Special Topics in Food Chemistry. 2 cr. hr. Two lectures. Prereq.: 613, 806; Chemistry 681, 682, 649 or equivalent.

Ag. Biochem. 898 Interdepartmental Seminar in Nutrition and Food Technolofy. 1 cr. hr.

Ag. Biochem. 950 Research in Biochemistry. 5-15 cr. hr.

1966 On July 1, 1966 the Department of Agricultural Biochemistry of the College of Agriculture and Home Economics became -

Department of Biochemistry
College of Biological Sciences

1967 All course numbers were changed in the University.

new		old	
Biochem.	431	Ag. Biochem.	613
"	511	"	610
"	521	"	611
"	531	"	620
"	541	"	621
"	611	"	705
"	612	"	707
"	613	"	709
"	621	"	706
"	622	"	708
"	623	"	710
"	693 Individual Studies	"	701
"	785 Research Principles and Techniques	"	701
"	811	"	807
"	821	"	808
"	831	"	809
"	850	"	804
"	851	"	813
"	898	"	898
"	999	"	950

1968 Department of Biochemistry
becomes
Academic Faculty of Biochemistry and Molecular Biology

Biochem 705 New sequence in General
706 Biological Chemistry
707 Each course 5 cr. hr. 705, 707,
708 and 709 taught jointly with
709 staff from Departments of Physiological
710 Chemistry and Chemistry. (See below).

1969 Courses and curricula for the Academic Faculty of Biochemistry and Molecular Biology.

Numbers in parenthesis below course number indicate old number of 1966 and before.)

500-599 Intermediate courses that provide undergraduate credit which may be counted on a major and graduate credit only in other departments.

600-699 and 700-799 Advanced courses providing undergraduate credit which may be counted on a major or field of specialization and providing graduate credit.

800-999 Graduate credit only.

Biochem. 511 (610) Introduction to Biological Chemistry. 4 cr. hr. Three lectures. Prereq.: Chemistry 221 (quantitative analysis) and two quarters of biological sciences or permission of instructor.

Biochem. 513 Biochemistry and Molecular Biology. 3 or 4 cr. hr. Three lectures. Prereq.: two quarters of organic chemistry and two quarters of biology. Students registering for 4 cr. hr. are required to demonstrate knowledge in depth of a specified topic. 513 and 514 (see below) form a two quarter sequence.

Biochem. 514 Biochemistry and Molecular Biology. 3 or 4 cr. hr. Prereq.: 513. Continuation of 513.

Biochem. 521 (611) Introduction to Biological Chemistry: Laboratory. 3 cr. hr. Two 3-hr. laboratories. Prereq. or concurrent: 511 or 513.

Biochem. 541 (621) Biochemistry of Animal Function. Laboratory. 3 cr. hr. Two 3-hr. laboratories. Prereq. or concurrent: 511 or 513.

Biochem. 551 (613) Chemistry of Foods and Food Processing. 5 cr. hr. Three lectures and two 3-hr. laboratories, Prereq.: Chemistry 211 (quantitative analysis) and 231 (organic chemistry).

Biochem. 693 (701) Individual Studies. 2-10 cr. hr. Prereq.: Six quarter hours credit in biochemistry.

Biochem. 705 General Biological Chemistry. 5 cr. hr. Three lectures. Prereq.: Chemistry 242, 244, or 253, (organic chemistry); physical chemistry background of kinetics and thermodynamics or permission of instructor. Same as Physiological Chemistry 705.

Biochem. 706 General Biological Chemistry: Laboratory. 5 cr. hr. Two 4 hr. laboratories. Prereq. or concurrent: 705, 706, 708, and 710 should be taken in sequence.

Biochem. 707 General Biological Chemistry. 5 cr. hr. Three lectures. Prereq. 705. Same as Physiological Chemistry 707.

Biochem. 708 General Biological Chemistry: Laboratory. 5 cr. hr. Two 4-hr. laboratories. Prereq.: 706.

Biochem. 709 General Biological Chemistry 5 cr. hr. Three lectures. Prereq.: 707. Same as Physiological Chemistry 709.

Biochem. 710 General Biological Chemistry: Laboratory Two 4-hr. laboratories. Prereq.: 708.

Biochem. 785 (701) Research Principles and Techniques. 2-10. Prereq.: Permission of Instructor.

Bio. Biochem. 811 (807) Proteins and Nucleic Acids. 3 cr. hr. Three lectures. Prereq.: 709 or equivalent.

Biochem. 821 (808) Enzymes 3 cr. hr. Three lectures. Prereq.: 709.

Biochem. 831 Carbohydrates. 3 cr. hr. Three lectures. Prereq.: 709, Chem. 635 (Chemistry of the carbohydrates) recommended.

Biochem. 850 (804) Seminar in Biological Chemistry. 1 or 2 cr. hr.

Biochem. 851 Special Topics in Food Chemistry. 2 cr. hr. Two lectures. Prereq.: 551; Chem. 242 (organic) and 531, 532 (physical).

Biochem. 898 Interdepartmental Seminar in Nutrition and Food Technology. 1 cr. hr.

Biochem. 999 (950) Research in Biochemistry. 5-15 cr. hr.

Suggested Program of Courses for a Major in Biochemistry and Molecular Biology leading to the B.S. degree

(For students with placement in Mathematics 150 and Biology 101)

First Year

Chem. 121 (Gen)	5	Chem. 122(Gen)	5	Chem. 123 (Gen)	5
Math. 150 (Algebra and Trig.)	5	Math. 151 (Calculus and Anal. Geom.)	5	Math. 152 (Calculus and Anal. Geom.)	5
English 101(Comp)	3	English 102(Comp)	3	English 103 (Comp)	3
ROTC or option	2	ROTC or option	2	ROTC or option	2
Phys. Ed.	1	Phys. Ed.	1	Phys. Ed.	1
Health	1				

Second Year

Biol.101 (Gen)	5	Biol. 201 (Animal Dev. and Adaptation)	5	Biol 202 (Plant Dev.)	5
Chem. 251 (Organic)	3	Chem. 252(Organic)	3	Chem. 253 (Organic)	3
Chem. 254 (Organic)	3	Chem. 255(Organic)	3	Math 255 (Diff. Equations)	5
Math. 153(Calculus and Anal. Geom.)	5	Math 254 (Calculus and Anal. Geom.)	5	ROTC or option	2
ROTC or option	2	ROTC or option	2		

Third Year

Chem. 221 (Quant.)	5	Biochem. 513 (Gen)	4	Biochem 514 (Gen)	4
Physics 231 (Gen)	5	Physics 232 (Gen)	5	Physics 233 (Gen)	5
Foreign Language	5	Foreign Language	5	Foreign Language	5
Elective	3	Humanities	5	Social Studies	5

Fourth Year

Chem 531 (Physical)	3	Chem 532 (Physical)	3	Humanities	5
Foreign Language	5	Biochem. 521 (Lab)	3	Electives	11-13
Social Studies	5	Social Studies	5		
Biol. Elective	3-5	Humanities	5		

Suggested Electives

Biological Sciences		Physical Sciences	
Biol. 630 (Genetics)	5	Chem. 533 (Physical)	3
Biol 401 (Cell Biology)	5	Chem. 551, 552 (Physical Lab.)	2, 2
Microbiol, 607, 609(General)	5, 5	Chem. 587 (Instrumental Anal.)	5
Biochem. 693 or 785 (Individual Studies)	5	Chem. 631 (Indent. of Org. Compounds)	5
Biol. 650 (Interpretation of Biological Data)	5	Chem. 635 (Carbohydrate)	3
Botany 630, 631 (Plant Physiology)	5	Comp. Sci. 241 (Computer Programming)	5
Botany 643 (Plant Develop, Anatomy)	5		
Zool. 234 (Comp. Anat.)	5		
Zool. 430 (Embryology)	5		
Zool. 432 (Gen. Physiol.)	5		
Physiol. 601, 602 (Adv. Mammalian)	5, 5		
Physiol. 635, 636 (human)	5, 5		
Biophysics 610 (Intr. to Photobiology)	5		

Requirements for the Master's Degree

All candidates for the Master's degree must complete a thorough training equivalent to an undergraduate major curriculum in chemistry which includes a year's work with laboratory in analytical, organic, and physical chemistry. Course work must include Biochemistry 705 through 710. Knowledge of chemistry is expected at the level of Chemistry 841, 842 and of some of biology at an advanced level. A dictionary reading knowledge of an approved foreign language is required.

Requirements for the degree Doctor of Philosophy

All of the above requirements for the Master's degree must be fulfilled. In addition, the program requires knowledge of several areas of biochemistry at the 800 level and other areas of biology, chemistry, or physics as may be necessary to support independent investigation in the area of biochemistry selected by the candidate in consultation with his adviser. A dictionary knowledge of two foreign languages or a comprehensive knowledge of one foreign language is required and these should be ordinarily chosen from German, Russian, French, Spanish, or Italian.

All students are expected as a part of their graduate training to assist in the teaching program.

Appendix C

Graduate Degrees earned in the Department together with Titles of Thesis and Dissertations. (Only degrees granted after the official organization of the Graduate School are listed).

Masters Degrees

1912 Call, Leland Everett, B.S.(Agr.)
M.S., "The Influence of the Time and Method of Preparing the Seedbed upon the Yield of Wheat."

Ruth, Walter Eugene, B.S.(Agr.)
M.S., "A Study of Some of the Factors which Affect the Composition of Sugar Beets During the Growing Season."

Smith, Clara, B.S. (Dom. Sci.)
M.S., "A Study of Pectin."

1913 Clevenger, Clinton B., B.S.(Agr.)
M.S., "An Experimental Study of the Chemical Changes Occurring in Ensilaged Plants."

Jones, Earl, B.S.(Agr.)
M.S., "A Study of the Availability of Phosphorus in One Hundred Ohio Soils."

Phillips, Thomas Guthrie, B.S.(Agr.)
M.S., "Chemical Studies on One Hundred Ohio Soils."

Thurston, Ariel Norton, B.A.
M.A., "A Study of the Methods of Crude Fiber in Foods."

1914 Fritz, Charles Millard, B.S.(Agr.)
M.S., "A Chemical Study of the Nutrition of Swine."

Richmond, Thomas Everett, B.A.
M.S., "A Study of the Organic Matter of Some Ohio Soils".

Salter, Frederick J., B.S.(Agr.)
M.S., "A Study of the Methods for the Determination of Arsenic in Organic Substances."

Salter, Robert Mundhenk, B.S.(Agr.)
M.S., "A Study of the Methods for the Determination of Arsenic in Organic Substances."

Stanton, Nellie Swartzel, B.S.(Dom. Sci.)
M.S., "A Study of the Adequate Diet for White Rats."

1915 Bernard, Raymund, B.A.
M.A., "Effects of High Protein Diet on Herbivora."

Black, Ellis Moore, B.A.
M.A., "A Study of Restricted Diet on Growth."

Keller, Adam Joseph, B.S.(Pharm.)
M.S., "The Action of Complex Copper Salts on Micro-Organisms and on the Cells of Animals."

Lebeson, Herman
M.S., "A Chemical Study of Certain Soils on the University Farm."

Strader, Lulu, B.S. (H.Ec.)
M.A., "Methods for Increasing the Protein and Mineral Contents of Bread and the Resulting Effects on Digestibility."

1916 Hancher, Kenneth Gibson, B.S.(Agr.)
M.S., "A Study of the Chemical Determinants in Growth, as Elaborated from the Ductless Glands."

McClure, George Matthew, B.A.
M.A., "A Study of the Availability of Plant Food in Soils."

Hutchinson, John L., B.S.(Agr.)
M.S., "A Study of the Effects of Heating on the Nutritive Value of Fats."

Smith, Arthur Henry, B.S., (Agr.)
M.S., "The Synthesis of Urea by Urease."

Trimby, James B., B.S.
M.A. "A Study of the Metabolism of Creatine and Creatinine."

1917 Palmer, Harry Wayne, B.S.(Agr.)
M.S., "The Preservation of the Ammonia in Manures by the Use of Chemicals."

Sleeth, Earle Campbelle, B.S.(Agr.)
M.S., "Proposed Plan of Arrangement of Plots for Fertility Investigations on the University Farm."

1918 Fergus, Ernest Newton, B.S.(Agr.)
M.S., "The Effect of Soil Acidity on the Fixation of Nitrogen by Bacillus Radicicola of the Soy Bean."

Grady, Roy Israel, B.S.
M.S., "Regarding the Presence of a Nitrogenous Substance in Rendered and Filtered Butter-fat."

Workman, Albert Clinton, B.Ph., M.A.
M.S. "The Ammonia-Fixing Capacity of Calcium Sulfate."

1920 Edgar, Rachel Hartman, B.S. (H.Ec.)
M.S., "The Effect of High Temperature on the Nutritive Value of Foods, Especially as Concerns the Vitamins or Accessory Substances."

1921 Benoy, Marjorie Pickard, B.S.
M.S., "The Separation of the Fatty Acids of Cocoanut Oil."

Boyd, Oscar Fisher, B.A., B.S.(Agr.)
M.S., "Absorption of Potassium by Soils."

Grant, Agnes Howard, B.S.(H.Ec.)
M.S., "Some Causes of the Retarded Growth and Malnutrition in Children from Two to Twelve Years of Age; Remedial Measures and their Results."

Hinkle, Carl Paul, B.S.
M.S., "The Composition of Corn-Soy Bean Silage as Influenced by the Variety of the Soy Beans Grown in the Corn-Soy Bean Combination."

Kitsuta, Kisaku, B.S.
M.S., "Feeding Calves on Soy-Bean Milk."

1923 Gullum, Frank Barnhart, B.S.
M.S., "The Hydrolysis of Acetin, Butyrin, Capryllin, Caprin, Laurin, and Myristin as Catalyzed by the Lipase of the Castor Bean."

Monroe, Charles Frederic, B.S.(Agr.)
M.S., "The Metabolism of Calcium, Magnesium, Phosphorus, Sulphur and Nitrogen in Dairy Cows Fed High and Low Protein Rations."

Steiger, Elsie Elenora, B.S.(H.Ec.)
M.S., "The Effect on Calcium Utilization by the Albino Rat of Iodine Added to a Calcium-poor Ration."

1925 Blystone, Inez Bernita, B.S.(H.Ec.)
M.S., "A Quantitative Determination of Vitamin B. in the White Potato."

Roberts, Roy Elmer, B.S.(Agr.)
M.S., "The Comparative Value of Some Animal and Vegetable Protein Supplements in a Ration for Laying Pullets."

1926 Sassaman, Howard Lester, B.A., B.S.
M.S., "Factors Affecting the Nutritive Properties of the Soy-Bean with Special Reference to Heat Treatment."

Wilkes, Ernest C., A.B., B.S.
M.S., "Detection of Beef in Pork Sausage."

1927 Dunlap, Charles Dillon, B.S.(Agr.)
M.S., "The Effect of Crude Fiber on the Digestibility of Feeds by Swine."

1928 Carroll, J. Cleve, B.S.
M.S., "The Hydroxy Fatty Acids of Cocoanut Oil."

1929 Gaessler, William George, B.S. (Pharm.)
M.S., "A Study of the Calcium Balance of Dairy Cattle."

Hartzler, Adrian Joseph, B.S.
M.S., "A Study of the Organic Food Reserves in Regional Strains of Clover and Alfalfa and the Relation of These to Winter Hardiness."

Strohschein, Ruth Madeline Kraft, B.S.
M.S., "The Effect of Baking Powder on Digestion."

Wu, Judith Cho-Hsiu, B.A.
M.S., "The Estimation of Aluminum in Animal Tissue."

1930 Bailey, Harmon Jackson, B.S.(Ed.)
M.S., "The Deterioration of Powdered Milk A Possible Reaction between Casein and Lactose as a Factor in Discoloration of Milk Powder."

Hull, Maurice Everett, B.S.(Agr.)
M.S., "Nutrition of Black Bass."

Hunter, Fred Johnston, B.A.
M.S., "The Presence of Manganese in Food and its Action in the Human Body."

Sanford, James Clarke, B.S.(Agr.)
M.S., "The Effect of Lactose upon the Hydrogen Ion Concentration of the Intestinal Contents of the Chicken."

Sun, Chia Yu, B.A.
M.S., "Influence of Moisture on the Oxidation of Milk Powder at 85° C."

Rohner, Ralph George, B.A.
M.S., "The Effect of Cellulose on the Digestion and Utilization of Protein by the White Rate."

1931 Barnett, David William, B.S.(Pharm.)
M.S., "The Determination of Copper in Biological Material."

Crum, Carlos Lowe, B.S.
M.S., "The Effect of Fat on the Utilization of Calcium Chloride by the White Rate."

Fischer, Raymond William, B.A.
M.S., "Fractionation of the Ethyl Esters Produced from Cocoanut Oil, within a Test for Hydroxy Fatty Esters in Certain Groups."

Gant, James Quincy, Jr., B.A.
M.S., "A Comparison of Whole Wheat and White Breads as a Factor in Digestibility of a Mixed Diet for Man."

Jaffe, Hyman, B.A.
M.A., "The Effect of Crude Fiber on the Digestibility of Proteins by the White Rate."

Walter, Edmund David, B.S.
M.S., "A Study of the Alleged Fungicidal Action of Pentathionic Acid."

1932 Dennison, La Vaughn, B.S.
M.S. "The Balanced Ration Cracker."

Haspil, Arnauld, B.S.(Agr.)
M.S., "A Study of Haitian Banana Flour."

Poffenberger, John T., A.B.
M.S., "Factors Influencing the Clarification of Milk Preceding Saccharimetric Lactose Determinations."

Wilder, Oliver H. W., B.S.(Agr.)
M.S., "The Iodine Content of Hens' Eggs as Affected by Iodine Intake."

1933 Wintzer, Anna Caroline, A.B.
M.S., "Preparation of a Food Sauce from Hydrolyzed Protein."

1934 Locke, John Irving, B.S., B.S., (Ed.)
M.S., "The Absorption of Calcium and Phosphorus as Affected by the Calcium-Phosphorus Ratio of the Ration."

Pettijohn, Orpha Glenn, A.B.
M.S., "The Effects of Base Exchange Treatment of Milk on Diffusible Calcium and Phosphorus."

Young, Luther Oman, B.A.
M.S., "The Enzyme Lactase."

1935 Breadey, Nettie Craddock Esselbaugh, B.S.(Ed.)
M.S., "A Study of the Gelation Process of Casein Systems."

Ewing, Harry Eastman, Jr., B.A.
M.S., "The Preparation and Properties of a Lactase Solution from A Loctase Fermenting Yeast."

1936 Jones, Ruth, B.S.(H.Ec.)
M.S., "The Effect of Potash Fertilizer on the Chemical Composition of Ohio Potatoes."

1937 Kronfeld, Emil, B.A.
M.S., "The Effect of Various Chemicals Upon the Blood Sugar of the Albino Rat."

Moody, Frank Baldwin, B.S.
M.S., "An Investigation of the Effect of Certain Commercial Treatments Upon the Chemical Composition of Two Types of Cured Tobacco."

1938 Armstrong, John Blandford, B.S.Ch.E.
M.S., "An Investigation on Vitamin B_1 with a Dropping Mercury Cathode."

Elliot, Doris Belle Eckfeld, B.S.(H.Ec.)
M.S., "The Use of the Chick in Vitamin B and G Assays."

1939 Katzenberger, Joseph G. B.S.(Agr.)
M.S., "Effect of Ultra-Violet Irradiation of Cows on the Vitamin D Content of Winter Milk, Butterfat, and Cream. The Vitamin D Distribution in Summer Milk."

Thomas, Virginia Rose Ebright, B.A.
M.S., "The Vitamin C Content of Fruits and Vegetables with Especial Reference to Factors which Influence Quantity and Stability."

1940 Jones, Frank Woodbury, B.S.
M.S., "The Quantitative Determination of Methemoglobin and Its Relation to Dark Beef."

Ketner, Ellsworth Hall, B.S.(Ed.)
M.S., "A Study of the Optimum Acidity for Use of Copper Sulfate as the Precipitant in the Determination of Lactose in Milk."

Larrick, Evelyn May, B.S.
M.S., "A Study of Products Obtained from Starch Waste Liquors by Fermentation with Clostridium Acetobutylicum."

1941 Lyttle, Nelson Edwards, B.S.(Ed.)
M.S., "A Study of the Composition and Uses of a Carbonasceous Tennessee Clay."

1942 Blackmore, Raymond Horner, B.S.(Agr.)
M.S., "The Carotene Content of Carrots and the Effect of Various Fertilizer Treatments on the Amount of Carotene Produced."

McCormick, Emma Kiffer, B.S.(H.Ec.)
M.S., "The Methods Used in Nutritional Research as Applied to Calcium Metabolism Studies in Hyperthyroid Disease."

Ortman, Cecil Kenneth, A.B.
M.S., "A Study of the Removal of Vitamin B_2 (Riboflavin) from Whey ."

Zwayer, Gerald Carr, B.S.(Agr.)
M.S., "The Effect of Fertilizer Treatments on the Composition of Garden Peas (pisum Sativum)."

1943 Shetlar, Marvin Roy, B.S.
M.S., "Thiamin Content of Typical Soft Wheat Mill Streams."

1947 Chichilo, Peter Paul, B.S.(Ed.)
M.S., "The Quantitative Determination of Anthocyanin Pigments in Plant Materials."

Conover, Leonard Sheldon, B.S.
M.S., "The Thiamin and Riboflavin Content of Scotch Blue Curled Kale when Grown in Various Controlled Nutrient Solutions."

Goldstein, Arthur Murray, B.S.
M.S., "The Kinetics of the Browing Reaction."

Manchester, Alice Jessie Gunn, B.S.
M.S., "The Use of Ducks to Teach Nutrition."

Sanshuk, Daniel, B.S.(Food Tech.)
M.S., "The Proteolytic Enzymes of Wheat Bran Layers."

Takashima, Tony Toshio, B.S.
M.S., "A Study of the Effect of Antioxidants on the Enzymatic Browning of Peaches."

1948 Culvern, Julian Brewer, B.S.(Agr. Ch.).
M.S., "The Effect of Potassium on the Chemical Composition of the Tomato Fruit."

Ma, Margaret Feng-ya Chang, B.S.
M.S., "A Study on Lipoxidase."

1949 Irmiter, Theodore Ferer, B.S.
M.S. "An Investigation into Possible Reactions between Lactose and Phospholipids in Milk."

Luthy, Paul Wayne, B.S.
M.S., "The Effect of 8-hydroryquinoline and Anthranilic Acid on Growth and Urinary Excretion of Niacin in the Albino Rat."

Pendse, Madhav Shankav, B.S.
M.S., "A Comparison of some Methods for Extraction and Determination of Vitamin A in Fish-Liver Oils."

Shelly, Kenneth Clair, B.S.
M.S., "The Effect of Growth Hormones upon the Chemical Composition of Tomato Fruit."

1950 Baker, J. Marshall
M.S., "A Study of the Removal of Sodium Ions from Milk by Cation Exchange Resins."

Draudt, Howard Ned, B.S.(Food Tech.)
M.S., "The Realtionship of Certain Biochemical Factors and Quality in Beef."

Gore, Ushakant R., B.S.
M.S., "The Relation of Certain Feeding Management Practices to Liver Vitamin A in Beef Cattle."

Paulson, Jack Charles, B.S.
M.S., "The Use of the Polarograph in the Quantitative Estimation of Peroxides Associated with Oxidized Butterfat."

Rexroad, Paul Randall; B.S.(Agr), B.S.(Ed.)
M.S., "Some Relations between Chemical Composition and Age of Alfalfa Plants."

Wettling, Charles Robert, A.B.
M.S., "Detergents for Cleaning Soiled Egges."

1951 Bulen, William Alfred, B.S.
M.S., "A Study of the Organic Acids of the Tomato Lycopersicum Esculentum Mill."

Hershberger, Truman Verne, B.A.
M.S., "The Relation of Certain Feeding Management Practices to the Biochemistry and Quality of Meat."

Hoover, Charles Abraham, B.S.
M.S., "A Study of Methods for Determining the Amount and Color of Fat in Meat."

Jones, Oscar, Jr., B.S.
M.S., "A Study of the Diethylstilbestrol Content of the Meat from the Chickens Treated with this Estrogenic Substance."

Read, Merrill Stafford, B.S.
M.S., Counter current Distribution Studies of the Polysaccharide HAPTENS from Bovine Erythrocytes."

1952 Linke, Ernest George, B.S.
M.S., "Chromatographic Separation of the Volatile Fatty Acids Produced in the Artificial Rumen."

Salzinger, Carl B., B.S.
M.S., "The Action on Casein of Certain Cation Exchange Resins Operating in the Sodium Cycle."

1953 Frear, Donald Stuart, B.S.
M.S., "A Study of the Nitrate Reduction of the Pea Plant (Leguminosae Pisum Sativum) with Special Reference to the Effect of Ascorbic Acid."

Liu, Calvin Yuen Yee, B.S.
M.S., "The Separation of Anazotic Organic Acid of Tomatoes (Lycopersicum Esculentum, Mill) with especial Reference to Carotenoid Formation."

Sigal, Rosamond Ruth (Harris), A.B.
M.S., "The Effect of Certain Mineral Deficiencies on the Organic Acids in Bean Plants (Phaseolus Vulgarus(."

Vanecko, Steve, B.S. Agr.
M.S., "Utilization of $N^{15}O_2$ - and $N^{15}O_3$ - by Excised Wheat Leaves."

1955 Arnold, Nancy H., B.S.
M.S., "Post Mortem Changes in the Interactions of Cations and Proteins of Beef and their Relation to Sex and Diethylstilbestrol Treatment."

Dinsmore, Douglas W., B.S.(Agr.).
M.S., "A Study of the Nitrogen Distributions in Normal Versus Abnormal Milks."

Keeler, Richard Fairbanks, B.S.
M.S., "A Study of the Molybdenum Requirements of Azotobacter Vinelindii."

Simon, Maria Peralta
M.S., "Anazotic Acids in Green Coffee Beans."

1956 Aphornratana, Kaisri Poshyachinda, B.S.
M.S., "Effect of Phosphate Compounds on Water Holding Capacity of Meat."

Baker, Thomas Irving, B.S.
M.S., "Studies on the Biotin Requirement of Rumen Microorganixms in Vitro."

Breitman, Theodore R., B.S.
M.S., "An Investigation of the Electrophoretic Components of Deoxyribunoclease."

1957 Akashian-Ashrafi, Vahe, A.B.
M.S., "The Mineral Composition of the Ash of Wheat Plants at Two Stages of Growth as Influenced by Variety, Season and Location."

Calo, Nona Luz, B.S. Chem.
M.S., "The Respiratory Metabolism of Aerated Potato Discs."

Keenan, Roy William, B.S.
M.S., "A Study of the Plasmalogens in the Blood of Normal Persons and of Patients with Atherosclerosis; and the Plasmalogen Concentration of Intimal and Medial Tissue of the Aorta."

1958 Al-Dawody, Ali Mohamed, B.S.
M.S., "Biogenesis of Asparagine."

Cole, James Harold, B.S.(Agr.)
M.S., "A Study of the Effect of Soft X-ray on Casein."

Danforth, Elliot, Jr. B.A.
M.S., "The Effect of Intestinal Absorption of Insulin in Rats."

1959 Abdul-Nour, Basima, B.C.
M.S., "Some Characteristics of Intact and Disrupted Ribonucleoprotein Particles from Pea Seedlings."

Directo, Leonor Balce, B.S.
M.S., "Factors Controlling Cellular Ageing in Plant Tissues."

Rawalay, Surjan Singh, B.S.
M.S., "The Organic Acids of Coffee in Relation to the Degree of Roast."

1961 Heintz, Roger, B.S.
M.S., "Ribonucleic Acid Synthesis by Enzymes from Rat Liver Nuclei."

Lepkowski, Wilbert C., B.S.
M.S., "The Partial Purification and Properties of Galactokinase from Saccharomyces Fragilis Yeast."

Sutter, Richard Paul, B.A.
M.S., "Biogenesis of Ribosomes."

1962 Kull, Frederick J., B.S.
M.S., "Studies on the Mechanism of Yeast Phosphoglucoisomerase and Control of Glucose-6-phosphate Metabolism."

Ramaley, Robert, B.S.
M.S., "Metabolism of D-Ornithine in Bacillus Licheniformis."

1963 Armstrong, Robert Lee, B.S.
M.S., "Studies on the Lactic Dehydrogenase Isozymes in Rat Liver and Adipose Tissue."

1964 Hutson, Nancy Katherine, B.A.
M.S., "The Effects of the Tetracycline Antibiotics on Inducible Enzyme Synthesis."

Piper, Walter N., B.S.
M.S., "The Effect of Certain Antibiotics on the Incorporation of C^{14}-Valine into a Cell-Free Microsomal Preparation from Escherichia coli B."

Preston, James Faulkner III, A.B.
M.S., "The Isolation and Partial Characterization of Polysaccharides from Penicillium charlesii G. Smith."

Sodja, Ann, A.B.
M.S., "Influence of Tetracyclines on Phagocytosis of Inert Particles by Polymorphonuclear Leucocytes."

Wang, Rong-Ine, B.S.
M.S., "The Effects of Various Anions and Cations on the Bacteriostasis of Escherichia coli by Oxytetracycline."

1965 Mulhausen, Hedy A., A.B.
M.S., "A Study of the Lactic Dehydrogenase Isozymes in Rat Epididymal Adipose Tissue."

1966 Fulton, Michael Miles, B.S. Ag. Biochem.
M.S., "Some Studies of the Biosynthesis of Protein Amino Acids in Cells of "Paul's Scarlet Rose."

1967 Schmotzer, Linda Ann, B.S.
M.S., "The Biogenesis of the Aglycone of Progoitrin."

1968 Acuff, Kenneth John
M.S., "The Effects of Oxytetracycline and Magnesium Ions on Protein Synthesis in Saccharomyces Cerevisiae."

1969 Qavi, Hamida Begum
M.S., "Temporal Relationship of Deoxyriboncleic Acid and Enzymes in Spleen of Mice Injected with Erythroagglutinin-Free Phytohemagglutinin or Sheep Red Cells."

Doctor of Philosophy Degrees

1917 Hughes, Josiah Simpson, B.S., M.S., M.A.
Ph.D., "Some Nutritive Properties of Corn."

1919 Bowers, William Gray, B.S., M.A.
Ph.D., "The Soy Bean as a Human Food."

1922 Bradfield, Richard, A.B.
Ph.D. "The Nature of the Inorganic Colloids in the Heavy Layer of the Putnam Subsoil of Northeast Missouri."

1925 Burrell, Robin Charles, B.S., M.A.
Ph.D., "The Effect of Certain Deficiencies on the Nitrogen Metabolism of Plants."

1926 Johnstin, Ruth Frances, B.A., M.A.
Ph.D., "Calcium-Pectin Equilibrium in Pectin-Water Sols."

Hunt, Charles Henry, B.S.(Chem.), M.A.
Ph.D., "A Study of the Influence of Fertilizers on the Vitamin B Content of Wheat."

McCreary, Otto, B.S.
Ph.D., "The Influence of Lactose on Deterioration of Milk Powder."

1928 Davis, Russell Edmund, A.B.
Ph.D., "The Metabolism of Tributyrin."

Kitsuta, Kisaku, B.S., M.S.
Ph.D., "The Storage of Calcium and Phosphorus in the Animal Body as Affected by the Vitamin A, B, C, and D Content of the Diet."

Webster, James Elias, B.S.(Agr.)
Ph.D., "Nitrogen Metabolism in Soybeans."

1929 Almy, Emary Frederick, B.S., M.S.
Ph.D., "The Effect of Certain Methods of Protein Precipitation upon the Polarimetric Determination of Lactose in Milk."

Guthrie, John Daulton, B.S.(Agr.)
Ph.D., "The Effect of Environmental Conditions on the Chloroplast Pigments."

Winter, Alden Raymond, A.B., M.S.
Ph.D., "The Nutritive Value of Blood Meal Proteins for Growth."

1930 Boyd, Oscar Fischer, B.A., B.S.(Agr.), M.S.
Ph.D., "The Utilization of Calcium Soaps by the White Rat."

Powell, Maude Nason, B.S., M.S.
Ph.D., "The Metabolism of Tricaprin."

1933 Gayley, Howard Emerson, A.B., M.S.
Ph.D., "The Hydroxy-Acid Content of Cocoanut Oil and a Proposed Method for the Determination of Acetyl Values."

1934 Sutton, Thomas Scott, B.S.(Agr.), M.S.
Ph.D., "Some Studies of Nerve Degeneration Associated with Avitaminosis A in the White Rat."

Walter, Edmund D., B.S., M.S.
Ph.D., "Avitaminosis A in the White Rat."

1936 Marquand, Carl Betram, B.A.,
Ph.D., "An Experimental Study of Glucose Formation from Fat in the White Rat Using a Modified Respiratory Apparatus."

Reiser, Raymond, B.A.
Ph.D., "A New Micromethod for the Partition of Lipids in Biological Material and Its Application to the Study of Lymph and Blood and to Nerve Degeneration in Avitaminosis A.

1939 Witman, Eugene DeWald, B.A.
Ph.D., "A Study of Calcium Arsenate and Basic Copper Arsenate as Insecticides."

1940 Pettijohn, Orpha Glenn, B.S., M.S.
Ph.D., "A Study of the Oxidation-Reduction Potentials of Ohio Soft Red Winter Flours and Doughs."

1941 Wolfe, Alvin Clair, B.A., M.S.
Ph.D., "A Study of the Chemical Changes Occurring during the Maturing Stages of Four Varieties of Soybeans."

1943 Marcy, Lawson Francis, B.A.
Ph.D., "The Efficiency of Utilization of Phosphorus by the Albino Rat."

Wilder, Oliver Mansfield, B.S.(Agr.), M.S.
Ph.D., "The Nutritive Value of Tankage in the Protein Supplements Fed to Fattening Steers as Determined by Nitrogen-Balance Studies with Steers and Rats."

1944 Breakey, Nettie Craddock Esselbaugh, B.S.(Ed.), M.S.
Ph.D. "Some Factors Involved in the Staling of Whole Wheat Bread."

Gum, Oren Berkley, B.S.(Agr.)
Ph.D. "The Effects of the Minor Elements, Boron and Manganese, upon the Quality of Vegetables with Especial Reference to the Tomato (Lycopersicon esculentum)."

1945 Gaver, Kenneth Merlyn, B.A.
Ph.D. "Monoalkylation of Starch."

Tieszen, Derk Vivien, B.A., M.A.
Ph.D., "Mono-alkylation of Starch."

White, Booker Taliaferro, B.S., M.S.
Ph.D., "A Study of the Chemical Composition of the Seeds of the Ohio Buckeye (Aesculus Glabra Wild) with Especial Reference to Their Saponin Content."

1946 Sheltar, Marvin Roy, B.S., M.S.
Ph.D., "A Chemical and Micro-Chemical Study of the Wheat Kernel with Special Emphasis upon the Individual Bran Layers."

1947 Gehrke, Charles Wilhelm, B.A., B.S.(Ed.), M.S.
Ph.D., "The Action of Mineral-ion Exchange Resins on Certain Milk Constituents."

Houston, Forrest Gish, B.S., M.A.
Ph.D., "The Isolation and Identification or Characterization of Certain Chemical Components of Two Species of Solidago."

1948 Blackmore, Raymond H., B.S.(Agr.), M.S.
Ph.D., "Effect of Certain External Factors on the Oil and Protein Content of Soybeans and the Chemical Composition of the Component Glycerides of the Soybean Oil."

Das, Cromwell Osborne, B.S., M.S.
Ph.D., "A Study of the Alcohol Insoluble Fraction of Vegetables with Especial Reference to Quality of Lima Beans and Snap Beans."

Pensack, Joseph M., B.S., M.S.
Ph.D., "Investigations on the Unidentified Growth and Hatchability Factor of Animal-Protein Supplements."

1949 Varner, Joseph Elmer, B.S., M.S.
Ph.D., "Use of C^{14} in the Study of the Relation of Malic Acid to Glucose Metabolism in Bryophyllum."

1950 Halbrook, Everett Raymond, B.S.(Agr.), M.S.
Ph.D., "The Synthesis of Essential Poultry Nutritional Factors by Microorganisms (With Special Emphasis on Vitamin B_{12})."

Husaini, Saeed Ahmad, B.S., M.S.
Ph.D., "Biochemical Studies Relating to Quality in Fresh Meat."

Johnson, Clyde S., B.A.
Ph.S., "Application and the Modification of the Schechter-Haller Colorimetric Method to the Determination of DDT Residues in Alfalfa

Khan, Nurul Absar, B.S., M.S.
Ph.D., "Studies on the Autoxidation of Some Compounds Related to Oleic Acid."

Max, Roger Adam, B.A., M.S.
Ph.D., "Studies on the Mechanism of the Autoxidation of Fat Derivatives."

Meites, Samuel, A.B.
Ph.D., "Factors Influencing the In Vitro Digestion of Cellulose by Rumen Liquor in the Presence of Antiseptic."

Yamazaki, William Toshi, B.S., M.S.
Ph.D., "Quality Factors in Soft Wheat Flour."

1951 Irmiter, Theodore Ferer, B.S., M.S.
Ph.D., "The Lipolytic Enzymes Systems of Milk."

Moinuddin, Jessie Elizabeth (Fischer), B.S.(Agr.), M.S.
Ph.D., "The Mechanisms of Lactose- Induced Laxation and Adaptation to Lactose-Induced Laxation in the Albino Rat."

Underwood, Gerald E., B.S., M.S.
Ph.D., "A Study of the Non-Caffein Nitrogenous Compounds of Coffee."

Usdin, Vera Rudin, B.S., M.A.
Ph.D., "An Investigation of the Lipides of Rhodotorula Gracilis."

1952 Paulson, Jack Charles, B.S., M.S.
Ph.D., "Some Factors Concerned in the Hydrolysis of Proteins by Ion Exchange Resins."

1953 Carangal, Apolinario Reyes, Jr., B.S.A.
Ph.D., "Effects of Nitrogen, Phosphorus and Potassium on the Organic Acids of the Tomato, Lycopersicum exculentum Mill."

Wierbicki, Eugen, B.Agr., D.Agr.
Ph.D., "Effect of Castration on the Biochemistry and Quality of Meat."

1954 El-Gindy, Mohamed Momtaz Said Ahmed, B.S., M.S.
Ph.D., "The Distribution of Minerals and Proteins in Whole Wheat, Flour and Flour Fractions as Influenced by Variety, Season and Fertilizer Applications."

Johnson, Ronald Roy, B.S., M.S.
Ph.D., "The Role of Cobalt in the Ruminant Animal."

Mabrouk, Ahmed Fahmy, B.S., M.S.
Ph.D., "A Study of the Trans Fatty Acid Content of Margarines and Shortenings."

Royal, Gladys Williams, B.A., M.S.
Ph.D., "The Influence of Rations Containing Sodium Acetate and Sodium Propionate on the Composition of Tissues from Feeder Lambs."

Sutton, William James Leonard, B.S., M.A.
Ph.D., "An Investigation of Variations in the Concentration of Lactose, Chloride, Sodium and Potassium in "Normal" and "Abnormal" Milk of Individual Cows."

Whitaker, John R., A.B.,
Ph.D., "Mechanism of Protein Hydrolysis by Ion Exchange Resins."

1955 Bulen, William Alfred, B.S., M.S.
Ph.D., "The Isolation and Characterization of Glutamic Dehydrogenase from Leaves."

Clements, Robert L., B.S.
Ph.D., "A Study of the Seasonal Changes in the Composition of Maple Sap and Syrup with Special Reference to the Changes in Composition that Occur in Making Maple Syrup."

Draudt, Howard Ned, B.S.(Food Tech.), M.S.
Ph.D. "The Chemistry of Hemoglobin and Myoglobin in Relation to the Color of Meat."

Frear, D. Stuart, B.S., M.S.
Ph.D., "A Study of the Intermediates Concerned in Nitrate Reduction in Higher Green Plants."

Fritsch, Carl W., B.S.
Ph.D., "Autoxidation of Fats and Their Derivatives."

Hershberger, Truman Verne, B.A., M.S.
Ph.D., "Studies on the Utilization of Non-protein Nitrogen by Rumen Microorganisms in Vitro."

Ish, Carl Jackson, A.B., M.S.
Ph.D., "Electrochemical Properties of an Ion Exchange Membrane."

Kamstra, Leslie, B.S., B.S.M.S.
Ph.D., "Digestion of Cellulose from Different Sources by Rumen Microorganisms."

1956 Cole, Leslie J.N., B.S.(Agr.), M.S.
Ph.D., "Chromatographic Procedures for the Isolation of the Original Constituents of Natural Waxes, with Special Reference to the Study of Ouricuri Wax."

Read, Merrill Stafford, B.S., M.S.
Ph.D., "The Effect of Hormones on the Intermediary Metabolism of Mammary Glands."

1957 Bowers, Miriam A. Derks, B.S.
Ph.D., "A Study on Lipogenesis in Mammary Tissue."

Dehority, Burk A., A.B., M.S.
Ph.D., "Isolation, Identification and Studies on the Metabolism of Rumen Growth Factors in Natural Materials."

Hunt, Walter G., B.A.
Ph.D., "A Study of Proteolytic Factors in Rumen Microorganisms."

Keeler, Richard Fairbank, B.S., M.S.
Ph.D., "Molybdate Metabolism of Azotobacter."

Marks, Joy D., B.S., M.S.
Ph.D., "Metabolism of Aging Cells."

Vanecko, Steve, B.S. Agr., M.S.
Ph.D., "Oxidative Phosphorylation in Cotyledons of Pisium sativum, var. Alaska."

Wu, Ming-An, B.S., M.S.
Ph.D., "The Flavonoids of the Tomato (Lycopersicum esculentum)."

1958 Bernlohr, Robert William, B.S.
Ph.D., "Studies on Some Intermediate Reactions in Bacterial Protein Synthesis."

Breitman, Theodore R., B.S., M.S.
Ph.D., "Some Aspects of Nucleic Acid and Protein Synthesis in Cell Nuclei."

Carr, Leonard Barrett, B.S.
Ph.D., "Bacterial Organization and Related Biochemical Function."

Slocum, Donald H., B.S., M.S.
Ph.D., "The Mechanism of Arsenate-Activation in Enzymatic Reactions

1960 Huang, Ruchih Chow, B.S., M.S.
Ph.D., "The Cause of Cellular Senescence and Its Prevention."

Keenan, Roy W., B.S., M.S.
Ph.D., "Studies on Phospholipid Biosynthesis with Special Reference to the Plasmalogens."

Lingrel, Jerry B., B.S.
Ph.D., "An Investigation of the Later Stages in Protein Synthesis."

1961 Al-Dawody, Ali Mohamed, B.S., M.S.
Ph.D., "The Enzymatic Synthesis of Asparagine."

Ambellan, Elisabeth, B.S., M.A.
Ph.D., "The Effect of Nucleotides on Morphogenesis and Ribonucleic Acid Synthesis in Amphibian Embryos."

Maynard, Donald E., B.A., M.S.
Ph.D., "Isolation and Identification of the Acid-Soluble Nucleosides and Nucleotides of Penicillium charlesii."

1963 Jordan, John Maxwell, B.S.
Ph.D., "Studies on Metabolism in Penicillium charlesii. Some Relationships Between Dicarboxylic Acid Metabolism and Production of Galactocarolose."

1965 Davis, Joan Spinanger, B.S., M.S.
Ph.D., "Studies on the Kinetics and Mechanism of the D-Glucose-6-Phosphate Ketol-Isomerase Catalyzed Reaction."

Last, Jerold Alan, B.S., M.S.
Ph.D., "Studies on the Mechanism of Action of Oxytetracycline on E. coli."

Sandmeyer, Esther E., M.S.
Ph.D., "Metabolic Studies Dealing with the Biosynthesis of Steroids in Rat Tissues."

1966 Modolell, Juan Bautista
Ph.D., "Adenosine Triphosphatase Activities of Rat Epididymal Adipose Tissue."

1967 Mulhausen, Hedy A., A.B., M.S.
Ph.D., "Studies on the Shift in the Lactate Dehydrogenase Isozyme Distribution Pattern in Rat Epididymal Tissue."

Appendix D

RESEARCH ASSOCIATES AND POSTDOCTORAL FELLOWS

Eugene D. Witman, A.B., Ph.D., 1939-1946

Fred E. Deatherage, A.B., A.M., Ph.D., 1940-1942

George Horace McFadden, B.S., B.S. (Pharm.), M.S., Ph.D., 1944-1949

Amos Grant Horney, A.B., M.S., M.A., Ph.D., 1945-47

Eugen, Wierbicki, B.Agr., Dr. Agr. (Munich), Ph.D., 1953-1956

Jack C. Paulson, B.S., M.S., Ph.D., 1953-1954

John R. Whitaker, A.B., Ph.D., 1954

Ahmed F. Mabrouk, B.S., Ph.D., 1954-1955

Robert L. Clements, B.S., Ph.D., 1955-1956

Robert C. Hiltibran, B.S., M.S., Ph.D., 1956

Joy D. Marks, B.S., M.S., Ph.D., 1957-1958

J. Lowell Young, B.S., Ph.D., 1956-1957

Patricia Broberg, B.S., Ph.D., 1956-1958

Mostafa K. Hamdy, B.S., M.S., Ph.D., 1956-1958

James M. Jay, A.B., M.S., Ph.D., 1956-1958

Cornelius Lentner, Ph.D., 1957-1958

Leonard Carr, B.S., Ph.D., 1958-1959

Reiner Hamm, Diplom. Chem. V., Freiburg, Diplom. Chem. H., Freiburg, Ph.D., Marburg, Bundesforschunganstalt fur Fleischwirtschaft 1958-1959

Apolinario Carangal, Jr., B.S., Ph.D., Assistant Professor, U. of the Philippines, Laguna, 1958-1960

Masao Fujimaki, Ph.D., Associate Professor, U. of Tokyo, 1961-1962

Rabindra N. Bhattacharyya, B.S., M.S., Ph.D., 1964-1966

John Malcolm Picken, B.S., Ph.D., 1964-1966

Kazuo Izaki, B.S., M.S., Ph.D., 1964-1965

Afzal A. Khan, B.S., M.S., Ph.D., 1964-1965

Pei-Hsing Wu, B.S., M.S., Ph.D., 1966-1967

Tikam L. Balwani, B.S., M.S., Ph.D., 1967-1969

John E. McIsaac, B.S., Ph.D., 1967-1969

Fathi M.Salama, B.S., Ph.D., 1967-1968

L.R. Subbaraman, B.S., M.S., Ph.D., 1967-1969

Hedy A. Muhlhausen, B.S., Ph.D., 1968

Kenneth Knaell, B.S.(Eng. Phys.), M.S., Ph.D., 1968-1969

Jijie Subbaraman, B.S., M.S., Ph.D., 1968-1969

Appendix E

FORMER FACULTY

Dept. of Agricultural Chemistry, 1882-1896

Dept. of Agricultural Chemistry, College of Agriculture, 1896-1916

Dept. of Agricultural Chemistry and Soils, College of Agriculture, 1916-1922

Dept. of Agricultural Chemistry, College of Agriculture, 1922-1948

Dept. of Agricultural Biochemistry, College of Agriculture, and Home Economics 1948-1966

Dept. of Biochemistry, College of Biological Sciences, 1966-1967

Academic Faculty of Biochemistry and Molecular Biology, College of Biological Sciences, 1967-present

Bachtell, Myron A.
B.S. (Agr.), Ohio State U., 1911; Assistant, 1911-1915; Assistant Professor (Extension), 1915-1920

Bear, Firman E.
B.S. (Agr.), Ohio State U., 1908; M.S., Ohio State U., 1910; Ph.D. U. of Wisconsin, 1917; Instructor, Ohio State U., 1908-1910; Assistant Professor, 1910-1913; Professor, Soils Investigation, U. of W. Virginia, 1914-1916; Professor, 1916-1922; Professor of Soils, 1922-1928

Beaudreau, Charles Arthur
B.S., U. of Washington, 1954; Ph.D., U. of Hawaii, 1963; Postdoctoral Fellow, Johns Hopkins, 1963-1966; Assistant Professor, 1966-1968

Bernlohr, Robert W.
B.S., Capital U., 1955; Ph.D., Ohio State U., 1958; Oak Ridge National Lab, 1958-1959, Assistant Professor, 1959-1963

Bloomfield, Lloyd M.
B. Agr., Ohio State U., 1891, Assistant, 1891-1896

Conrey, Guy Woolard
A.B., U. of Michigan, 1916; Ph.D., Ohio State U., 1921; Instructor, 1917-1921; Assistant Professor, 1921

Diamondstone, Thomas I.
A. B., S. B., University of Chicago, 1954, 1957 resp.; Ph. D., Rutgers, 1963, Research Investigator, U. of Pennsylvania, 1962-64; Assistant Professor 1964-69.

Dougall, Donald Keir
B.Sc. (Hon), U. Western Australia, 1952; M.Sc., (Hon) U. Western Australia, 1953; Ph. D., Oxford, 1956; Postdoctoral Fellow, Nat. Res. Council of Canada, 1956-1957; Research Associate, U. of Wisconsin, 1957-1959; Lecturer, U. of Sydney, 1959-1963; Assistant Professor, 1963-1967; Associate Professor, 1967-present; Associate Professor, Microbial and Cellular Biology and Associate Dean, College of Biological Sciences, 1967-present

Edgar, Rachel Hartman
B.S., (H. Ec.) Ohio State U., 1920; M.S., Ohio State U., 1920; Instructor, 1922

Froning, Henry Bernhardt
M.A., Ohio State U., 1918; Instructor, 1918-1919

Gander, John E.
B.S., Montana State U., 1950; M.S., U. of Minnesota, 1954; Ph. D., U. of Minnesota, 1956; Assistant Professor, Chemistry, Montana State U., 1956-1958; Assistant Professor, 1958-1963, Associate Professor 1963-1964.

Gaver, Kenneth M.
B.A., Ohio State U., 1930; Ph. D., Ohio State U., 1945; Instructor, 1945-1946

Haley, Dennis Edward
B.S. (Agr.), Pennsylvania State U., 1918; M.S., Pennsylvania State U., 1918; Ph. D., Ohio State U., 1922; Instructor, 1918-1920

Hirsch, Rudolph
B.S., Ohio State U., 1901; Instructor, 1901-1905

Hutchinson, John L.
B.S., Kansas State U., 1913; M.S., Ohio State U., 1916; Instructor, 1914-1918

Johnson, Orville M.
B.S. (Agr.), Ohio State U., 1908; Assistant, 1908-1911; Assistant Professor, (Extension), 1911-1916

McClure, George M.
B.A., Ohio State U., 1914; M.S., Ohio State U., 1916; Instructor, 1915-1922

Mendicino, Joseph
B.S., Case, 1953; Ph.D., Western Reserve, 1958; Postdoctoral Fellow and Research Associate, Western Reserve, 1958-1962; Assistant Professor, 1962-1968

Phillips, Thomas Guthrie
B.S. (Agr.), Ohio State U., 1912; M.S., Ohio State U., 1913; Ph.D., U. of Chicago, 1917; Instructor, 1912-1915; Assistant Professor, 1915-1923; Professor, 1923-1925

Rogers, Palmer, Jr.
B.S., Yale, 1950; Ph.D., Johns Hopkins, 1957; Oak Ridge National Lab, 1957-1959; Assistant Professor, 1959-1963

Salter, Frederick J.
B.S. (Agr.), Ohio State U., 1913; M.S., Ohio State U., 1915; Instructor, 1914-1915

Shetler, Marvin
B.S., Kansas State U., 1940; M.S., Ohio State U., 1945; Instructor, 1945-1946

Sleeth, Earle Campbelle
B.S., U. of Nebraska, 1916; M.S., Ohio State U., 1917; Instructor, 1916-1917

Varner, Joseph Elmer
B.S., Ohio State U., 1942; M.S., Ohio State U., 1943; Ph.D., Ohio State U., 1949; Owens Corning Fiberglas, 1943-1944; Military Service, 1944-1946; Battelle Memorial Institute, 1946-1947; Research Associate, Ohio State U., 1949-1950; Assistant Professor, 1950-1955; Associate Professor, 1955-1958; Professor, 1958-1961

Vinson, Albert Earl
B.S., Ohio State U., 1901; Instructor, 1901-1903

Watson, True George
B.S. (Agr.) Ohio State U., 1913; M.S., Iowa State U., Instructor, 1918; Assistant Professor, 1921; Secretary of College of Agriculture, 1921

Webster, George Calvin
B.S., Western Michigan, 1948; M.S., U. of Minnesota, 1949; Ph.D., U. of Minnesota, 1952; California Institute of Technology, 1952-1955; Associate Professor, 1955-1959; Professor, 1959-1961

Witman, Eugene DeWald
B.A., Ohio State U., 1935; Ph.D., Ohio State U., 1939; Postdoctoral Fellow, Entomology and Agr. Chemistry, 1939-1941; Assistant, 1935; Research Associate, 1942-1945; Instructor and Research Associate, 1945; Associate Professor, 1946-1947

Workman, Albert Clinton
Ph.B., Hiram; A.M., Hiram; M.S., Ohio State U., 1918; Instructor, 1918-1919

Appendix F

COOPERATING FACULTY IN ORDER OF APPOINTMENT

in order of appointment

Edward Riley Allen, Soils, Ohio Agr. Exp. Station

John Bernis Brown, Physiological Chemistry

Alvin L. Moxon, Animal Science

Orville Bentley, Animal Science

Melville Wolfrom, Chemistry

William Bulen, Kettering Foundation, Yellow Springs, Ohio

Ralph Johnson, Institute of Nutrition and Food Technology

Robert L. Clements, Institute of Nutrition and Food Technology

Leo P. Vernon, Kettering Foundation, Yellow Springs, Ohio

Donald Keirs Dougall, Microbial and Cellular Biology

Quentin Van Winkle, Chemistry

James Harper, Dairy Technology

Raymond Doskotsh, Pharmacy

Michael Klapper, Chemistry

Benjamin Meleca, Microbial and Cellular Biology

Robert Mayer, Chemistry

Gary B. Collins, Organismic and Developmental Biology

FACULTY WITH 25 OR MORE YEARS OF SERVICE

Henry Adam Weber
1845-1912

Otterbein College, 1861-1863; Graduate of Polytechnic School, Kaiserslantern, 1866; Student of Chemistry under Von Liebig and Reischer and of Mineralogy under Von Kobell, Munich, 1866-1868; Ohio Geological Survey, 1869-1874; Professor of Chemistry, U. of Illinois, 1874-1882; Ph.D., Ohio State U., 1879; Professor and Chairman, Agr. Chemistry, 1884-1905; Professor, 1905-1912

Alfred Vivian
1867-1943

Ph.G., U. of Wisconsin, 1894; Instructor Pharmacognosy, U. Wisconsin, 1894-1895; Assistant, Agr. Chemistry, U. of Wisconsin, 1895-1897; Instructor in Agr. Chemistry and Assistant Chemist, U. of Wisconsin, 1897-1902; Associate Professor, 1902-1906; Professor and Chairman, 1906-1915; Dean, College of Agriculture, 1915-1932; Dean Emeritus, 1932

John Franklin Lyman
1881-1963

B.S., Massachusetts Agr. College, 1905; Ph.D., Yale, 1909; Assistant, 1905-1906; Assistant, Physiological Chemistry, Yale, 1906-1909; Associate Professor, 1909-1914; Professor and Chairman, 1915-1948; Professor, 1948-1951; Professor Emeritus, 1951

Emory F. Almy
1895-1964

B.S., U. of Nebraska, 1916; M.S., U. of Nebraska, 1917; Graduate Assistant, Agr. Chemistry, U. of Nebraska, 1916-1917; Assistant, 1919-1921; Instructor, 1921-1925; Assistant Professor, 1925; Associate Professor, 1933; Professor, 1940-1960; Professor Emeritus, 1960

Robin Charles Burrell
1896-1966

B.S., Mt. Union, 1918; M.A., Ohio State U., 1921; Ph.D., Ohio State U., 1925; Assistant in Chemistry, 1919-1921; Associate Professor, Chemistry, U. of Richmond, 1921-1923; Instructor, 1923-1925; Assistant Professor, 1925; Associate Professor, 1933; Professor, 1940-1958; Professor Emeritus, 1958

Thomas Scott Sutton
1902-

B.S., (Agr.), Ohio State U., 1928; M.S., Ohio State University, 1929; Ph.D., Ohio State University, 1934; Instructor in Dairy Production, 1934-1936; Assistant Professor, Animal Husbandry, 1936-1940; Associate Professor, Animal Husbandry, 1940-1942; Professor of Animal Science, 1942-1948; Professor and Chairman, Agr. Biochemistry, 1948-1950; Professor and Chairman, Agr. Biochemistry and Assistant Dean, 1950-1951; Professor and Chairman, Animal Science and Assistant Dean, 1951-1955; Ohio State U. -USAID Program Leader, India 1955-1957; Associate Dean, 1957; Associate Dean Emeritus, 1967.

Fred E. Deatherage
1913-

A.B., Illinois College, 1935; A.M., U. of Illinois, 1936; Ph.D., State University of Iowa, 1938; D.Sc., (Hon.) Illinois College, 1960; Instructor, Iowa, 1938-1940; Research Associate, Ohio State U., 1940-1942; Research Chemist, Kroger Co., 1942-1946; Assistant Professor, 1946-1948; Associate Professor, 1948-1951; Professor and Chairman, 1951-1964; Professor, 1964-present; Ohio State U./USAID, U. of Sao Paulo, Brazil, 1964-1968

Appendix H

From the Autobiography of John Franklin Lyman

"As graduation neared (1905) I was thinking seriously about what next for me. My professor advisor (at Massachusetts Agricultural College, now The University of Massachusetts at Amherst) had heard of a position as Assistant at Ohio State University in the department of Agricultural Chemistry. The salary was $900 plus free tuition in the graduate school, and opportunity to cary one-third of a full schedule. I had partly decided to take a job with a large-scale fertilizer manufacturing company, the American Agricultural Chemical Company, in their plant at Sparrows Point, Baltimore. Professor Wellington was rather vague about the Ohio job, and he was a funny guy. The boys called him "Tabby." He wore a frock coat with pockets in the tails in which he carried all sorts of stuff. I've seen him take out from there one by one, a towel, crucible tongs, matches, a book, "Sartus Resartus," remarking, "You know, we don't wear the right clothes at all. I haven't got on any socks right now!"

Even after I started for Baltimore he sent me a telegram: "Come back. The Ohio job is open." I went on south. I wanted to try it. I liked Tabby, but I mistrusted his judgement. In Baltimore I rented a room from Sam Wiley (an Alumnus fraternity brother), and right after breakfast every day we went to work: an hour's ride on the trolley and about half a mile walk beyond the end of the line. Factories, docks piled up with bags and boxes and a few tumble down houses, -- that was Sparrow's Point. You could look down the bay, clear to the sun. Goats, pigs, geese ran loose in the streets. Our laboratory occupied the first floor of an old dilapidated frame building house.

We would take off our clothes, put on a pair of bib overalls and pitch in, with no stop for lunch, until 4 o'clock when we put on our street clothes and returned to Sam's house. I was getting $10 a week, enough to pay my expenses. After I had been there about two weeks Sam went on vacation and left me in charge of the laboratory. I had to analyze the fertilizers we made so that each lot of "goods" contained 1% nitrogen, 8% phosphoric acid, and 1% of potash. Our "goods" contained a total of 10% fertilizing elements: the rest was "filler", consisting of anything cheap, such as sweepings from woolen mills or shoe factories and canneries, refuse, peat, etc. The company did no experimental or research work, and the chemist was not consulted as to policies or any business of the company.

After awhile I heard again that the Ohio job was still open, so I thought I'd better find out what prospects for advancement I would have if I stayed with the company. The answer came back, "Wait until Christmas."

I wrote to Ohio and they accepted me. I left Baltimore about September 1, 1905, and in Columbus I rented a nice front room on Neil Avenue near the University for $ 15 a month, and boarded there for $3.50 a week. I was very much pleased with the university and with the Department of Agricultural

Chemistry. Alfred Vivian was Head. Henry A. Weber, former Head, was semi-retired, and nearly disabled. My name completed the list of departmental staff.

My duties were to supervise the student laboratories. We had a class of about fifty Agricultural students, another class of about thirty girls from Home Economics, and a few others in "Advanced Courses." The department had more space than needed; however, during the previous year the Chemistry building had burned to the ground, and all the students previously taught there were transferred to our building, Townshend Hall. We were crowded, with 328 freshmen and smaller classes in Organic, Analytical, Metalurgical, Pharmacuetical, Physical. The ventilating hoods for removing noxious gases did not function, so the air of the laboratory was badly contaminated with all of these students working in one big room.

I had met Professor Vivian and Mrs. Vivian in Amherst when they had stopped to visit the Massachusetts Agricultural Experiment Station. Dr. Lindsey had then asked me to guide them around the grounds. The Vivians were gracious, cultured, and kindly. They invited me to their home and introduced me to their friends.

I made friends quickly with students and faculty, and attended the First Congregational Church, whose pastor, Dr. Washington Gladden, had perhaps half of the University Faculty in his congregation.

I think it was my first Saturday afternoon, when I sat in the bleachers at the Athletic Field watching football practice, that a student sat down beside me and started a conversation. I soon gathered that he mistook me for a freshman. He brought up fraternities and what I thought of them, and when I said I was a member of one, Kappa Sigma, he nearly fell off his seat. "Well, that's my fraternity," he said, holding out his hand. We gave each other the secret grasp. His name was Luke Zartman, and he invited me to the chapter house, -- at that time a large, old dwelling house on Clark Place. The members were fine, earnest men who became important in business and professions: John Kennedy, Ralph Hoyer, Pete and Robert Laylin, and Jack Kohr.

After I became acquainted with the students in Agriculture, some of them invited me to come to their chapter house to eat with them and to meet the members. They had a fine crowd of serious minded, fine-principled men, the Alpha Zeta, taken from the Agricultural College and limited to those of high scholarship. For some time I took my meals with them at their house on Highland Street near the campus, and several have been my most respected, lifelong friends: Harry Ramsower, James McClintock, Leland Call, Paul Gerlaugh, Henry Vaughn, and Jack McNutt, all later prominent educators.

It was not long after the University calendar year opened that Vernon Davis, a young Instructor in the Horticultural Department, called on me with an invitation to join a group of faculty people who called themselves "The Recre-

ation Club." They were a number of the older and highest-ranking professors, as well as young instructors, and their parties were very informal, occurred every two weeks, consisted of dancing, tallyho rides, groups to see a horse show, etc. I bought a dress suit and used it frequently. Most of the young folks like me did not pair off with a steady, but tried to manage so no girl would be left without an escort.

It was a happy year. I earned credit for ten semester hours in Organic Chemistry, and ten hours in Bacteriology. My salary of $900 was enough to pay all my expenses. Professor Vivian seemed to be pleased with my services, character and personality, for he began to speak of a permanent position for me in his department. He had concentrated on what he called "Soil Fertility", and he suggested that he sould like to have me prepare to teach the courses for Home Economics students in Food and Nutrition.

I though that a good idea, and that I would be willing to train for it. So, the best place to get such training being Yale University, under Prof. Russell Chittenden, I applied for a scholarship there. In due time I was notified that I had been awarded a fellowship paying $100 -- the price of tuition for the year 1906-'07.

Toward the end of summer I went to Amherst, where my parents and sister lived, and where there was a competitive examination for a position as clerk in the post office. I took the exam and qualified as substitute clerk. What I wanted was summer work, and I did work during that summer.

My mother had a few hundred dollars which she was willing to loan me to pay board and room at Yale, about $600, or enough for one year. I hoped to earn $100 or so as a substitute clerk during the following summer, and some more as a tutor. However, toward the end of my second year at Yale I could not see how I could raise enough to come back for my last year. I wrote to Dean Vivian that I would come back to Ohio, teach a year, then return to Yale. He replied that he hoped I could arrange to keep on until I finished the program he had laid out. So I went to Dr. Chittenden and told him I was out of money and would have to drop out.

A few days later Dr. Chittenden called me in and explained that he had been commissioned by the United States Government to investigate a problem for the Food and Drug division of the Bureau of Chemistry. He needed six volunteers to work on the project, to continue throughout the summer and providing $80 a month in cash, plus board and room. I did not hesitate.

The years at Yale were pleasant. Yale, in those days, was leader in the realm of Physiological Chemistry. The name "Biological Chemistry" had not come into general use; "Medical Chemistry" was sometimes used. I went there in the autumn of 1906. When I went to the laboratory, expecting to find Dr. Chittenden, I was surprised to be met by Dr. Lafayette B. Mendel, who informed me that Dr. Chittenden had been elected Dean of the Sheffield

Scientific School, and that he was now in charge of Physiological Chemistry. Mendel was a young man, of whom I had never heard. However, I soon learned that he was an able and fine man who had already made an excellent record as teacher and researcher. His students and his fellow scientists never gave a thought to race or creed in Mendel's case. All thought of him only as a fine man in every way.

The science of Physiological, or Biological Chemistry as it is now called, was in its infancy when I landed in New Haven in 1906. Yale had the only large research and teaching department in the United States, and Mendel at that time had fifteen to twenty students who were candidates for the Ph.D., among them a few women preparing for careers in research or teaching. In my time he had one Japanese, Dr. Tadiesu Saiki, M.D., who later became Director of the Japanese Imperial Institute of Nutrition. To illustrate the general lack of interest in Biochemistry in America in 1906, the case of Otto Folin is a good example: Dr. William McPherson, Head of Chemistry at Ohio State told me that he and Dr. Folin took Ph.D. degrees together at the University of Chicago, and afterward Dr. Folin was terribly discouraged because he was utterly unable to find a position in the United States. Finally he did find a position, at the Hospital for the Insane at Walpole, Mass, where he invented methods for the analysis of blood and urine.

Mendel conducted the business of his laboratory without much formality. On meeting him for the first time I inquired about how to register as a student, and he said, "Oh, I'll make out your schedule. Any time before Thanksgiving, go over to the Graduate School Office and have the clerk register you." So, one day in November I went there and told the lady what I wanted. She said, "Where have you been, all this time?" She did not seem to be very angry.

Because I was a Fellow, I was expected to perform certain services, such as proctoring undergraduate examinations, and odd jobs that Dr. Mendel directed. One day he told me to go to the office and ask the cashier to give me five dollars, go to Malley's store and buy two yards of unbleached linen, then to take the receipt and change back to the cashier. When I came to Ohio State I envied him that freedom in the buying of small necessities for the department.

At Ohio State, we were required to make out a requisition in triplicate, take it to the Department Head for his signature, then to the purchasing agent, who had to get bids from several companies, and finally we must get approval from the Executive Committee. By the time goods were delivered, they often were no longer needed. It was ridiculous.

Professor McPherson once told me that he needed something called a "devil's touchstone", merely a flint-and-steel arrangement that makes a spark when you squeeze it in your hand. He had the University order three, marked "Rush!" Now it so happened that one day I was in Boston and strolled into the A.D. Little Research and Testing Laboratory to see what was going on, and Dr. Little, when he learned that I was from Ohio State, said, laughing,

"That's a funny place. They send me an order for three devil's touchstones, marked 'Rush', at a dollar apiece, and now, six months later, they've not paid the bill!"

Mendel did not give many written tests, and no oral examinations at all. Not even for admission to candidacy, satisfaction of foreign language requirements, or qualification for the Ph.D. degree. Later he was required by action of the Graduate Faculty to give all these examinations. He told me, "I do not need to give my students formal examinations. If they are not doing well, I say, 'I think you would like it better at Columbia,' and so they go there. As to language requirements, I assign papers weekly in French and German to be reviewed and reported before our Seminar. So I know you can read these papers. And as for the final examination, I know you are going to pass by that time."

At that time, 1906, Mendel was doing research on a variety of subjects. My first assignment was a small problem: someone had given him two large pythons, which he gave me with instructions to study the water-soluble muscle fraction. (At that time not much was known of reptilian muscle.) I found that lactic acid was one component, the type called sarco lactic that is found in other vertebrates. Also I found creatin, which distinguishes vertebrates from invertebrates, as the chief soluble nitrogenous compound. I also identified adenin and potassium phosphate. Many years later the importance of these two was found in adenosine triphosphate, and adenosine diphosphate, important as transfer agents such as chemical potential to muscular work, and in other transformations.

This whole field of purines and nucleoproteins, and especially the nucleic acids, became the central point later in many studies of cellular chemistry.

When I came back to Ohio State in 1909 I found several graduate students who desired to work in Biochemistry. Since no graduate program had been formulated, I was not ready to put these fellows to work. I recommended that they go to Yale. One student, Arthur H. Smith, took a M.S. degree with me before going to Mendel's laboratory, where he took his Ph.D. degree and taught under Mendel until Mendel's death in 1935. About 1914 I took on my first Ph.D. candidate, Josiah S. Hughes, who was awarded that degree in 1917. From that time on, I always had a few graduate students, the majority working on metabolism of fatty acids.

In 1916, having been at Ohio State for seven years and being elegible for a Sabbatical leave, I was granted a year's leave of absence with $1800 stipend. Dr. Mendel and Yale University invited me to work in Mendel's laboratory as a guest of the University. I spent a long time learning to do a surgical operation on dogs, so that a small glass tube could be placed in the thoracic duct and lymph collected. The object was to feed a particular kind of fat to the dog, anesthetize him, insert the tube, collect the lymph for as long as the dog could stay alive and the lymph flowing, and then examine the lymph to assess the amount of fat and how it matched in kind and amount the amount fed. These experiments were disappointing. At first the lymph

flowed steadily and contained a lot of fat, but rather soon the lymph flow stopped, and fat content declined. I concluded that the anesthetic interfered with digestion, and practically stopped it. It did not seem practical, or indeed possible, to make a permanent opening (the animal inevitably dies after such an operation), so further experiments on the lymph gland were abandoned. For the rest of the year I worked on the relation of the kinds of fat fed to the kind deposited in his adipose tissue. I wrote two papers reporting these experiments to the American Society of Biological Chemistry. A year or so later, I was elected to membership in that society. (Editors Note: Dr. Lyman was the first and for many years the only O.S.U. faculty member to be invited into membership). In the spring of 1917 I returned to Columbus. My salary, which was $1500 as Associate Professor in 1909, had been raised to about $2000. I received an invitation from the University of Maryland to come to discuss a position. Their offer was considerably more than I had been getting, so I went to Dr. Thompson. He did not hesitate a monent, and he replied, "Dr. Lyman, if you stay here, your salary will be $2700." It didn't take me more than a second to say, "I'll stay."

I never regretted it. The University was progressing, growing larger, improving the quality of its faculty and gaining prestige. Salaries were low, compared with business and other professions, but adequate to support a comfortable family life. A dollar went a long way. I did not pay any income tax until late in the thirties, and even the Depression did not cause my family any particular inconvenience. The University did not miss a single pay day, even though there were a few times when we professors had to go to the State Treasurer's office and be paid in cash. My salary in the late Twenties had risen to $6000, and was cut during the Depression to $4500. The cut was made up for, in part, by lowered prices. In 1940 my salary was back to $4750, and finally to $6000. I added something to my salary by consulting fees, abstradting for "Chemical Abstracts." The latter paid my dues in the American Chemical Society.

But few professors are good managers of finance, and hindsight shows me where I might have made a fortune, had I invested in the late twenties in General Motors, then selling at around $11 per share. I invested, instead, the stipend from some consulting work which I had done, in the Cleveland Discount Company, and lost all of the thousand I invested except for about $235. However, others lost more heavily than I in the stock-market crash in '29 and '30.

One can always look back and see turning points, possible ways which might have led to more fame and fortune. One of these came to me, I later perceived, when I obtained my Ph.D. degree in 1908 from Yale, and I went to Ohio State. Another job was open at the University of Wisconsin, where my friend Elmer V. McCollum had gone to work, following his graduation from Yale in 1908. Wisconsin offered me $900 to come there, and in spite of the small salary, this seemed a good offer. A few years later, McCollum became famous as the discoverer of Vitamin A, and his laboratory has become illustrious

for its many important discoveries relating to the composition of foods and the requirements of animals, classified under the headings: proteins, fats, carbohydrates, vitamins, major mineral elements, such as calcium, phosphorus, magnesium, sodium, potassium, chlorine; and the minor, or trace elements.

Had I gone to Wisconsin instead of Ohio State, I undoubtedly would have shared in the experimental work from which all these immensely important discoveries came, and shared, too, in the satisfaction and glory of it.

But at that time, I was eager for a larger amount of salary than Wisconsin gave, and as I was eager to marry, I decided to accept Dean Vivian's offer. At Ohio State, teaching was the chief activity, with not much opportunity for research. The teaching load was about heavy enough to prevent taking up a major research project and pursuing it with vigor. However, I did some creditable research, and trained about twenty doctoral students, and perhaps forty or fifty students for the Master of Science degree."

Appendix I

PRESENT FACULTY

Serif, George S.
B.S., McMaster U., 1951; M.S., McMaster U., 1953; Ph.D., McMaster U., 1956; Postdoctoral Fellow, Minnesota, 1956-1957; Postdoctoral Fellow, Scripp's Clinic and Research Foundation, 1957-1958; Assistant Professor, U. South Dakota, 1958-1962; Associate Professor, U. South Dakota, 1962; Assistant Professor, 1962-1965; Associate Professor, 1965-1967; Professor and Chairman, 1967-present

Deatherage, Fred E.
A.B., Illinois College, 1935; A.B., U. of Illinois 1936; Ph.D., State University of Iowa, 1938; D.Sc., Illinois College, 1960; Instructor, Iowa, 1938-1940; Postdoctoral Fellow, Ohio State University, 1940-1942; Research Chemist, Kroger Co., 1942-1946; Assistant Professor, 1946-1948; Associate Professor, 1948-1951; Professor and Chairman, 1951-1964; U. of Sao Paulo (Ohio State University-USAID), 1964-1968; Professor, 1964-present.

Moore, Richard Owen
B.S., DePauw U., 1942; Ph.D., Cornell U., 1951; Assistant Professor, 1951-1955; Associate Professor, 1955-1959; Visiting Professor, Harvard Medical School, 1959-1960; Professor, 1960-present; Acting Chairman, 1964-1966

Snell, Junius Fielding
B.S., Texas, 1943; M.S., Wisconsin, 1945; Ph.D., Wisconsin, 1949; Head, Fermentations Research Lab, Charles Pfizer and Co., 1945-1946; Head, Dept. Radiobiochemistry and Director, Pfizer Therapeutic Institute, 1950-1961; Professor, 1961-present; Acting Chairman, 1966-1967

Barber, George A.
A.B., Rutgers, 1951; Ph.D., Columbia, 1955; Research Biochemist, U. California, Berkeley, 1955-1957 and 1960-1964; Biochemist, Conn. Agr. Exp. Sta., 1957-1959; Associate Professor, 1964-1965; Associate Professor, Biochemistry and Biophysics, U. Hawaii, 1965-1968; Professor, 1968-present

Ives, David H.
A.B., Cornell College, Mt. Vernon, Iowa, 1955; Ph.D., Minnesota, 1960; Postdoctoral Fellow, Wisconsin, 1960-1962; Assistant Professor, 1962-1967; Associate Professor, 1967-present

Behrman, Edward J.
B.S., Yale, 1952; Ph.D., U. of California, 1957; Research Fellow, New England Deaconess Hospital, 1957-1960; Research Fellow, Harvard Medical School, 1960-1961; Research Associate, 1961-1964; Assistant Professor, (Research) Brown U., 1964-1965; Assistant Professor, 1965-1967; Associate Professor, 1967-present

McConnell, David G.
A.B., Columbia, 1949; A.M., Columbia, 1949; Ph.D., Indiana, 1957; Research Associate, Comparative and Physiological Psychology, Ohio State University, 1957-1960; Research Associate, Institute of Vision, Ohio State University, 1960-1961; Britannica Center, Palo Alto, California, 1961-1962; Associate Professor, Institute of Vision, 1962-1965; Associate Professor, Biophysics, 1965-1968; Associate Professor, 1968-present

Scott, Roy A.
B.S., Cornell, 1958; Ph.D., Cornell, 1963; Assistant Professor, Chemistry, Cornell, 1963-1966; Assistant Professor, U. of Hawaii, 1966-1968; Associate Professor, 1968-present

Zubkoff, Paul L.
B.A., U. of Buffalo, New York, 1956; M.S., George Washington U., 1958; Ph.D., Cornell, 1961; Junior Research Biochemist, U. California, L.A., 1961-1963; Research Associate, Massachusetts Institute of Technology, 1963-1966; Assistant Professor, 1966- present

Gross, Elizabeth L.
B.A., U. of California, 1961; Ph.D., U. of California, 1967; Postdoctoral Fellow, Institute of Botany, Stockholm, 1966-1967; Postdoctoral Fellow, Charles Kettering Research Lab., 1967-1968; Assistant Professor, 1968-present